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A principled approach to collaborative knowledge creation in service industries

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A PRINCIPLED APPROACH TO COLLABORATIVE KNOWLEDGE CREATION IN SERVICE INDUSTRIES

By

Mahsa Mahmoud Jahantab

July 2017

A thesis submitted in partial fulfilment of the University's requirements for the Degree of Doctor of Philosophy

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List of abbreviations

AL	Action Learning
BRS	Britain Rail Service (a fictitious name, used to preserve confidentiality and anonymity)
CKC	Collaborative Knowledge Creation
CL	Collaborative Learning
CMSorg	A fictitious name, used to capitalise on Captive-Market environment, Service organisation and also preserve confidentiality and anonymity of participants
CS	Customer Service
CU	Coventry University
Ep-s	Effective problem-solving
IS	Information system
KBV	Knowledge-Based View
KC	Knowledge Creation
KCb	Knowledge Creation barrier
KET	Knowledge Elicitation and Transfer
KM	Knowledge Management
KT	Knowledge Transfer
PTI	Platform Train Interface
RQ	Research Question
TC	Theoretical construct

'Would you tell me, please, which way I ought to go from here?'

'That depends a great deal on where you want to go.'

Lewis Carroll

Acknowledgements

I thank Alexeis García Pérez, my director of studies, for all his effort and support throughout this research, Anthony Olomolaiye, my first supervisor, who supported me to undertake this research and motivated me to succeed and Steve Martin, my second supervisor, who encouraged me to succeed.

I thank all the individuals from the different firms that participated in this research for their valuable insights that contributed to this thesis.

There are those close to home who contribute to the completion of this research by putting me in a position to start, sustain and finish the research. For this reason and many others, I would like to dedicate this thesis to my family. Thanks especially to Mahmoud – this thesis is for you. Friends have also played their part and they all deserve my thanks for being good to encourage and support me.

Abstract

This thesis describes research carried out to investigate and address the problems associated with knowledge creation through collaboration between diverse stakeholder groups within service industries in the UK. Collaboration is an emerging necessity for organisations and has been influenced by the evolving need for gathering segmented groups with diverse knowledge and experience in developing new solutions to support addressing complex problems in a domain. Use of new technologies, to some extent, assists interaction and collaboration between segregated stakeholders. This approach has been a feasible solution for real-time communication in virtual environment; however, knowledge boundaries in addition to stakeholder boundaries influence the recognition of the problem-related factors affecting different stakeholder groups in a domain and results in conflicts of perspectives and ineffective interaction between stakeholder groups.

The origin point of this research was revolved around investigating the limitations of the existing approaches to engaging segregated stakeholder groups in knowledge creation and developing a new approach to address a key service organisation's complex problem. consequently, this thesis addresses the research question *How to reduce the limitations of existing approaches to collaborative knowledge creation in service industries?* In doing so, this research brings together literature on the fields of knowledge management empirical evidence to investigate the factors that influence the effectiveness knowledge creation through collaborations between different stakeholder groups. Review of the existing approaches to collaborative knowledge creation and the limitations of each approach shows that the effectiveness of collaborative knowledge creation has not been fully achieved. This resulted in developing, refining and validating a new approach to collaborative knowledge creation by applying it in different service industries.

The research has resulted in a number of contributions to knowledge and benefits for the stakeholder groups involved. A key contribution is a development of a new approach to collaborative knowledge creation called Ep-s to emphasise on Effective problem-solving. The applications of Ep-s in the field suggest that it eliminates some of the main deficiencies of well-known approaches to collaborative knowledge creation, and that it brings additional benefits to service industries. However, the research has identified areas where there is significant scope for further research and investigation.

In memory of Babaji

CHAPTER ONE

1. INTRODUCTION

Engaging stakeholder groups in collaborative knowledge creation has gained significant importance in service industry. The importance of involving stakeholder groups in collaborative knowledge creation for privatised service providers in the UK has become inevitable as the overall performance of the service providers relies on involvement and performance of numerous diverse and segregated stakeholders. Because of privatisation, the knowledge base of segregated organisations within privatised industries, to some extent, has become fragmented into separate, specialised knowledge domains. Due to such factors, collaboration between stakeholders who have divergent identities and may have limited common knowledge has become more complex.

This research has been undertaken to understand the challenges associated with collaborative knowledge creation and to develop a new approach to address some of the key challenges. This chapter presents an introduction to the context of the research, the challenges associated with collaborative knowledge creation and the proposed approach.

1.1. Introductory remarks

This thesis conveys the research conducted in the field of knowledge management (KM) with its emphasis on KM practices, in particular, knowledge creation (KC) practice within the framework of collaborative projects. Its focus is the topic of engaging stakeholders with problem-centred knowledge in collaborative knowledge creation (CKC) within service industry. The utility of this research is to reveal CKC's problematic aspects from the analysis of real cases of collaborative projects with the aim to develop a new effective approach to CKC.

Collaborative approach to knowledge creation has many potential benefits for the concerned stakeholders. However, some constraints influence the feasibility of this approach. Torfing *et al.*, (2012) inform that confidentiality, in particular, is one of the difficult challenges associated with encouraging individuals and groups to participate in collaboration activities. Burke (2011) emphasises that trust and shared feeling of ownership of goals have significant influence on the event of knowledge transfer. Thursfield (2015) clarifies that knowledge is understood as intellectual property. Khvatova and Block (2017) affirm that this intellectual property protects the position of individuals within a domain

The effectiveness and success of engaging stakeholders in collaborative knowledge creation has been limited by a number of issues that include the following:

- Knowledge is understood as intellectual property that protects the position of individuals within a domain; it draws boundaries and creates challenges related to participating in CKC
- Characteristics of knowledge such as unproven, ambiguity and redundancy
- Collaborative knowledge creation is the result of transforming individual's knowledge into group knowledge through effective interaction between the group members. The key challenge associated with this characteristic is creating shared context among individuals who have conflicting perspectives
- Diverse characteristics of stakeholders

This research revolves around better understanding of the problems related collaborative knowledge creation, the limitation of existing approaches that address some of these problems, developing a new approach to address some of those limitations. The new approach covers the factors affecting the success of stakeholder collaborations and knowledge creation. Some of the key aspects of the new approach are validated through its application in two major service industries. In addition, the areas that have significant scope for further investigation and research are identified in this thesis.

The remainder of this chapter describes the foundation and development of the research reported in this thesis. This chapter provides the description of the research problem and summary of the proposed approach to address the problem of collaborative knowledge creation in service industry followed by the outline of the thesis.

1.2. Research context

1.2.1. Privatised service industries in the UK

Mccartney and Stittle emphasise that although the key point of privatisation was promoting competition, government-imposed fragmentation of industries in the UK, as in many other countries, involved break-up of previously integrated industry that resulted in reduction in quality of the services (2012). Moreover, Casson (2004) remarks that for rail industry, for example, competition could be developed in every segment of the industry except for infrastructure which has been a natural monopoly. He notes that the marketing of rail services has been damaged by fragmentation. He explains that Train Operating Companies have found it difficult to build brand awareness with passengers. Most of their attempts at improving service have been undermined by the poor quality of the track. Some operators realised that it was risky to invest in a brand whose reputation could be undermined by a monopoly supplier beyond their control. This is not an exception for the customers of any service industry if the service provider is only supplier in a region.

The reduction of the quality of services provided by privatised captive markets was followed by the increasing recognition of public interest in the quality of services provided by such industries for which there is limited competition and little (or no) customer choice. Due to such factor, the last decade has witnessed a growing number of customer representation groups and regulatory bodies in the UK, regulating services provided by privatised industries. As a consequence, existing organisations are under an increasing pressure to achieve lower level of customer dissatisfaction. There has been a distinct possibility that to improve the overall performance of the privatised industries, collaboration between the stakeholders will eventually be needed. Horlick-Jones (2008) remarks that the idea of *stakeholder engagement* has become an important dimension in management thinking.

Joshi *et al.* (2016) explain that an intangible source of knowledge for an organisation is the customers' knowledge gained through experiencing the service they receive which is not only a reliable source for better understanding of customer needs but also it is a valuable source for better understanding of customer expectations.

Customers create one of the major stakeholder groups of service providers (Coviello and Joseph, 2012). Wang and Lo (2003) explains that as a key indicator of customer-focused

performance, customer satisfaction has often been considered one of the important dimensions of business performance. Nonaka *et al.* (2001) remark that experimental knowledge represents tacit knowledge that is shared among internal and external stakeholder groups including customers. Prahalad and Ramaswamy (2004) remarks that 'co-creation experience' revolves around the creating effective consumer-company interactions that provide opportunities for collaborative problem-solving and although it has certain benefits for the improvement of business performance, many firms are reluctant to let go of the traditional passive transaction-based relationship between firm and consumer. Schneider (2005) emphasise that the 'co-creation experience' developed by Prahalad and Ramaswamy is innovative; in addition to understanding that consumers determine the value of products and services, it allows consumers to be actively engaged in co-creation of value.

The above discourse shows the importance of engaging stakeholder groups in collaborative knowledge creation for the contemporary privatised industries in the UK. This collaborative knowledge creation involves the sharing or joint utilisation and development of knowledge among people who do not typically work together and who have substantially different knowledge domains. Consequently, this type of collaboration to succeed needs distinctive collaborative knowledge creation approach.

1.2.2. The concept of collaborative knowledge creation

Alavi (2000) explains that Knowledge Management (KM) consists of dynamic practices and activities at individual, social and organisational levels. Nonaka and Takeuchi emphasise that knowledge creation (KC) is the essence of any KM strategy (1995). Knowledge creation mostly is the outcome of collaboration between stakeholders from different levels and firms (Hartley *et al.*, 2013). Theories of collaborative knowledge creation emphasise on the significant advantage of collaborative networks and inter-organisational interactions that supports creating new solution to complex problems (Engeström, 2008). Prahalad and Ramaswamy (2004) remarks that KC revolves around creating effective consumer-company interactions that provide opportunities for collaborative problem-solving and although it has certain benefits for the improvement of business performance, many firms are reluctant to let go of the traditional passive transaction-based relationship between firm and consumer. Schneider (2005) emphasise that the in addition to understanding that consumers determine the value of products and services, collaborative knowledge creation allows consumers to be actively engaged in co-creation of value.

1.2.3. Historical development

Collaboration is an emerging extension of learning theories that has been influenced by the evolving need for gathering individuals with diverse expertise in addressing complex problems in a domain. Use of new technologies, to some extent, assists interaction and collaboration between individuals, however, the limitations of technology-based approaches has negative impact on the effectiveness of the collaboration. Collaborative learning approaches describe joint meaning making (Stahl *et al.*, 2006) and participation (Sfard, 1998) as the challenges associated with computer-supported collaborative learning. Sfard (1998) remarks that social factors such as representing human behaviour and sense-making are the problems related to use of computer programmes in collaboration. Stahl *et al.*, (2006) emphasise that exploring and understanding are essential in successful collaborations and computer-supported collaborations is helpful for coding preconceived behaviours and counting pre-defined features rather than joint meaning making.

1.2.4. Technology-based versus people-based approaches to CKC

Data-centric collaboration approach can rely on virtual information and computational environment that support data sharing (Chin and Lansing 2004). This approach has been a feasible solution for real-time communication in virtual environment, however, problem-centred approach, requires real environment that facilitates real-life interaction and knowledge transfer. Creating and maintaining an environment for knowledge transfer demands facilitation experts to hold an environment for the concerned members of stakeholder groups, co-creating solutions around agreed problems.

1.3. Research problem

1.3.1. The definition of research problem

Downe *et al.* (2004) remark that in the United Kingdom, in particular, case studies and national surveys reveals that collaboration across different stakeholder groups assists solving complex problems. Cairns, *et al.* (2013) affirm that facilitating collaboration across stakeholder boundaries is an effective approach to developing collaborative solution to the problem affecting the domain. However, as they clarify, the diverse stakeholder groups have different perception of the factors affecting the problem and they have different

understandings of desirable solution. They suggest developing a new approach that creates and maintains common ground among the concerned stakeholders. Roeder (2013) affirms that facilitating collaboration between different and diverse stakeholder groups requires skilful leadership. He remarks that facilitating stakeholder engagement in collaboration and maintaining their commitment throughout the collaboration are two of the factors that identify the strong relationship between effective leadership and effective collaboration.

CMSorg, one of the largest service providers in a specific service industry based in the UK, had to minimise the number of complaints it receives from its customers to meet the lowest level of customer dissatisfaction specified by the regulation authorities. The relationship between the factors shaping the origin of CMSorg problem is illustrated in Figure 1-1. CMSorg is the only service provider in its region (over 10,000 square miles) (CMSorg is a fictitious name, used to capitalise on Captive-Market environment, Service organisation and also preserve confidentiality and anonymity of participants).

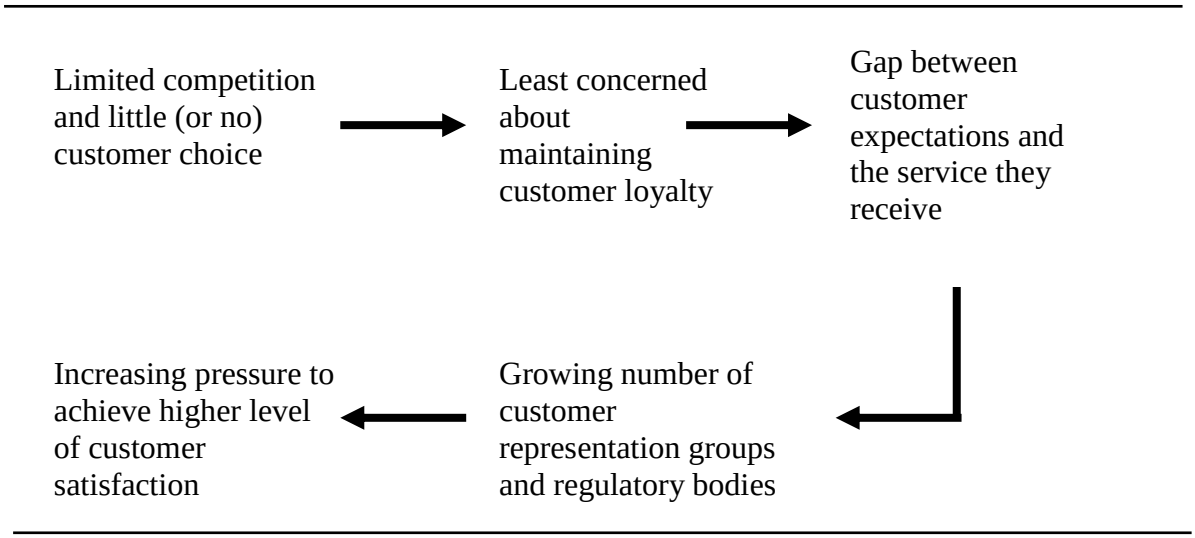

Figure 1-1. Model of factors shaping the origin of CMSorg problem with level of customer dissatisfaction

With more than 10,000 employees and over 5,000,000 customers across the UK, this organisation has always put extra value on providing quality service to its customers, and for that reason the causes of the high level of customer dissatisfaction were not explicit. Schwarz defines that the problem is the gap between what is expected from the service provider and what is provided (2002). For CMSorg, what customers expect from its service was mysterious. In response to this, CMSorg demanded academic research from Coventry

University (CU). Coventry University suggested that KM research team can help the CMSorg to solve its problem.

The researcher played a key role in this collaboration by identifying the internal and external stakeholders with problem-centred knowledge and facilitating the engagement of those stakeholders in investigating the causes of customer dissatisfaction with CMSorg.

This KM project formed the beginning of the development of the new approach to CKC reported in this thesis. The new approach followed three main stages that are as follows:

- Creating a team of stakeholder groups who have problem-centred knowledge and are willing to learn from and with each other
- Creating and holding knowledge transfer environment
- Leading collaborative knowledge creation

1.3.2. The research questions

The researcher conducted a review of the theories about CKC during and after the collaboration with the CMSorg. The combination of theory and practice in engaging stakeholder groups in collaborative knowledge creation resulted in defining the primary research question as:

> ***How to reduce the limitations of existing approaches to collaborative knowledge creation in service industries?***

The complexities of the problem defined by the primary research question justifies that addressing the limitations of existing approaches to collaborative knowledge creation requires research in a number of areas that are as follows:

- Investigating existing approaches to collaborative knowledge creation
- Understanding the methods of measuring the success of those approaches
- Considering the benefits and limitations of the approaches

These factors illustrate the need for defining a number of more specific secondary research questions (RQ), derived from the primary research question that have to be answered, to some extent, in this research.

The method of identifying stakeholders with problem-centred knowledge developed during the KM project with CMSorg. It was clear that selecting the stakeholder groups who can contribute to the success of collaborative knowledge creation is a critical stage of the approach as it has direct influence on the success or failure of the collaboration. Therefore, the following research question was defined:

RQ.1. How can collaborative knowledge creation benefit from engaging the right stakeholder groups?

The collaboration between CU and CMSorg focused on the concepts of *knowledge transfer* and *problem-solving*. The term *collaborative knowledge creation* is the result of the review of the literature to identify the term relevant to this research. Consequently, the following research question was defined:

RQ.2. What does the concept of collaborative knowledge creation mean and what is its relationship with problem-solving?

The KM project with CMSorg involved diverse stakeholder groups that did not have same skills or expertise and to make the communication between them add value to problem-solving process, it was important to consider and address group dynamics. Therefore, the following research question was defined:

RQ.3. What is the relationship between group dynamics and success of collaborative knowledge creation?

The collaborative knowledge creation project with the CMSorg included both virtual and real environment for interaction between stakeholder groups. The interaction in the real environment or the people-based approached was followed by better results than the interaction in virtual environment. However, the potential role of communication technologies in collaborative knowledge creation project was not clear. Therefore, the following research question was defined:

RQ.4. What is the role of communication technologies in the process of collaborative knowledge creation?

The experience of successfully finding a solution for the problem or creating knowledge through exploiting the stakeholders' knowledge suggested that the same approach can be applied in other domains. Consequently, the following research question was identified:

RQ.5. How can success of the process of collaborative knowledge creation be assessed?

There is a correlation between addressing these secondary research questions and understanding the primary research question in this thesis. Finding definitive answers for these additional questions is out of the scope of this thesis and the researcher will address them to the extent which promotes better understanding of the primary research question.

1.4. The research aim and objectives

Followed by defining the research problem as a result of collaboration with CMSorg, the aim of this research was defined as:

The definition and validation of a new approach to CKC that addresses some of the key limitations of existing CKC approaches.

In order to do so, the following objectives were defined:

1. Reviewing the development of the concept of CKC and the limitations it has encountered followed by Defining the concept of 'collaborative knowledge creation' used throughout this research
2. Reviewing the key areas emerged from the early stages of collaborations with service industry in this research that leaded to the development of a new approach to CKC
3. Identifying the available methodological choices for the research in areas such as engaging diverse stakeholder groups in CKC
4. Investigating the existing approaches to collaborative knowledge creation
5. Defining a new CKC approach in service industries that addresses the key limitations of existing approaches
6. Implementing the new approach to CKC in service industry to assist the assessment of the its validity
7. Drawing and verifying conclusions on the validity of the new approach to CKC according to the data collected in service industries

1.5. Research contribution

The collaboration with CMSorg delivered benefits for the parties involved and in particular for the researcher and the organisation itself. Therefore, this research provides theoretical and practical contributions to the field of collaborative knowledge creation. The following presents the summary of key contributions of this research:

1. Contribution to the theory. The contribution of this research to theory is assisting the existing literature by addressing the key gaps in the process of engaging stakeholders in collaborative knowledge creation.

2. Contribution to the empirical context. The findings of this research address the limited empirical research at service organisations and at industry level in the area of collaborative knowledge creation.

3. Contribution to practice: the collaboration between the researcher and service organisations resulted in better understanding of the importance of collaborative knowledge creation for the service industries in terms of solving complex problems and improving their performance.

1.6. Outline of the thesis

The topic of collaborative knowledge creation and the outline of the research problem have been presented in this first chapter. The remainder of the thesis is structured in three parts.

The first part of this thesis comprises two chapters that are chapter two and chapter three. Chapter two describes the concept of collaborative knowledge management. It includes the investigation of the existing approaches that focused on addressing challenges associated with engaging stakeholders in collaborative knowledge management followed by lessons learned from implementing the approaches in different domains. In addition, this chapter includes a review of key topics that have influenced the development of the new approach to CKC in this research. Chapter three describes the research methodology that has been used in this research to address the research problem.

The second part of the thesis presents the proposed approach to collaborative knowledge creation. It covers the development and applications of the new approach to collaborative knowledge creation in two chapters that are chapter four and five. Chapter four presents the origins of identifying the new approach to CKC and describes its implementation in service industry. Chapter five describes the applications of the new approach to CKC.

The focus of the third part of the thesis is on assessment of the new approach to CKC. It consists of one chapter that is chapter six. Chapter six presents the analysis of the primary data collected during the conduct of this research and discusses the quality of the findings of this research. This chapter describes the process of reducing the large volume of primary data collected through observation and interview throughout the university-industry collaborations.

The summary of key contributions of the research, concluding remarks and list of the areas that will benefit from further research are presented in chapter seven.

The outline of the thesis structure is illustrated in Figure 1-2.

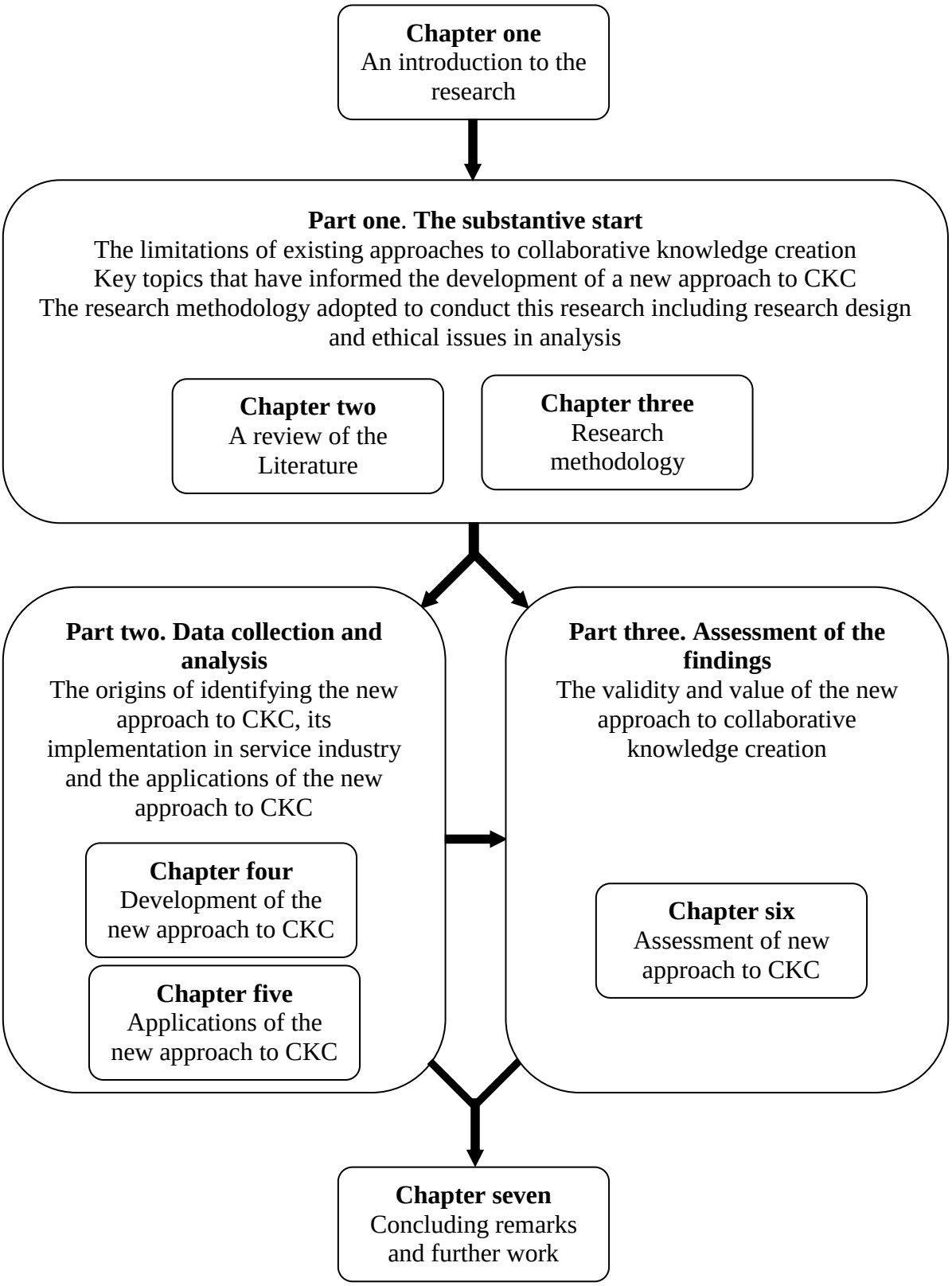

Figure 1-2. Outline of the thesis structure

CHAPTER TWO

2. LITERATURE REVIEW

After describing the focus of this chapter in the first section, the second section of this chapter provides a brief review of the emergence of collaborative knowledge creation. In order to address the difficulties associated with defining and identifying knowledge, the third section starts with a review of type and origin of knowledge in knowledge management context. The remainder sections of this chapter present a review of the literature that assists this research in investigating the key factors influencing the ineffectiveness of collaborative knowledge creation. The aim of this investigation is presenting the main factors that have to be considered by a fresh attempt to address the limitations that existing approaches to collaborative knowledge creation have encountered. The significant importance of this investigation for the development and assessment of a new collaborative knowledge creation is inevitable. Moreover, this chapter presents a review of the key areas emerged from the early stages of collaborations in this research with emphasise on assisting group dynamics that is potentially informative for the development of a new approach to collaborative knowledge creation.

2.1. The focus of the literature review

The limitations of existing approaches to collaborative knowledge creation in service industries define the research problem (discussed in chapter one, section 1.3) originates the research reported in this thesis. The existing researches in the area of CKC in different domains provide background on the challenges associated with CKC and therefore the literature review presented in this chapter aims to:

1. Clarify the key areas that have been facing the challenges associated with collaborative knowledge creation, in particular, where expertise and knowledge from different stakeholder groups are required.
2. Investigate the limitation of existing approaches to CKC to assist the development of a new approach to CKC in service industries that address such limitations.
3. Investigate the methods that supports measuring the success of approaches to CKC

The review of CKC problems in key domains included the assessment of the evaluation process of the methods that have been used which directed the process implemented by this research to evaluate the success of the proposed new approach to CKC.

In order to achieve such aims, this literature review focuses on the review of a number of research topics that are as follows:

- Collaboration, knowledge creation and their relationship with the concept of problem-solving
- Assisted knowledge creation in group collaborations
- Key challenges associated with the collaborative knowledge creation process that involves diverse stakeholder groups, including:
    - Identifying the required problem-centred knowledge for the CKC process
    - Selecting participants in the process
    - The impact of virtual and real environments in the process
- Evaluation process for approaches to CKC

With the intention of addressing these challenges, this chapter will continue with reviewing the literature that informed the development of a new approach to CKC.

2.2. The emergence of collaborative knowledge creation

Early in the 1990s, the term “knowledge creation” entered the organisational sciences literature, conveying the idea that companies can not only accumulate and use but literally create knowledge that enables them to progress (Nonaka 1991; Nonaka and Takeuchi 1995). At about the same time, the term “knowledge building” appeared in the learning sciences literature, representing the same idea (Scardamalia and Bereiter 2014; Scardamalia *et al.* 1994).

In addition to the knowledge management, however, there are other areas that have focused explicitly on engaging individuals or groups in problem-solving and knowledge creation activities. Some of these areas are as follows:

- Information system

  Kim *et al.* (2014) describe information system (IS) maturity as a key contextual factor that interacts with KM strategy. They emphasise that the impact of effectiveness of IS on improved knowledge transfer is significant.

- Organisational learning

  Dalkir (2011) notes that the key process required to both populate an organisational memory and to retrieve valuable knowledge for reuse from the same memory consists of the same steps as in the KM life cycle. The knowledge content to be presented, however, is defined much more narrowly as the key successes and key failures have a sufficient degree of generalisation.

- Collaborative learning

  Laal and Laal (2012) describe that collaborative learning (CL) involves the accumulation of individuals' knowledge shared with other individuals within an organisation and CL in inter-organisational context revolves around the same theory that involves the accumulation of different organisations' knowledge shared with other organisations within a domain.

- Training and development programmes

  Training and development programmes revolve around employee learning that assists the employees in learning required skills or knowledge for improving their performance (Jaspreet, 2016).

- Action learning

  Action learning (AL) is *an approach to working with and developing people that uses work on an actual project or problem as the way to learn. Participants work in small groups to take action to solve their problem and learn how to learn from that action. Often a learning coach works with the group in order to help the members learn how*

> *to balance their work with the learning from that work*. (O'Neil and Marsick, 2007, p. 6)

Based on the review of the areas mentioned above, the remainder of this chapter outlines some of the key challenges associated with the CKC process.

2.3. Collaborative knowledge creation in the field of Knowledge management

2.3.1. Theoretical foundations of knowledge management

Knowledge Management (KM) was initially defined as the process of applying a systematic approach to the capture, structuring, management, and dissemination of knowledge throughout an organisation (see Figure 2-1) to work faster, reuse best practices, and reduce costly rework from project to project (Nonaka and Takeuchi, 1995). Schultze and Leidner (2002) clarify that despite the difficulties associated with defining and identifying knowledge, knowledge has become a primary resource in organisations. They explain that organisations are implementing knowledge management practices and technologies on the promise of increasing their effectiveness, efficiency and competitiveness.

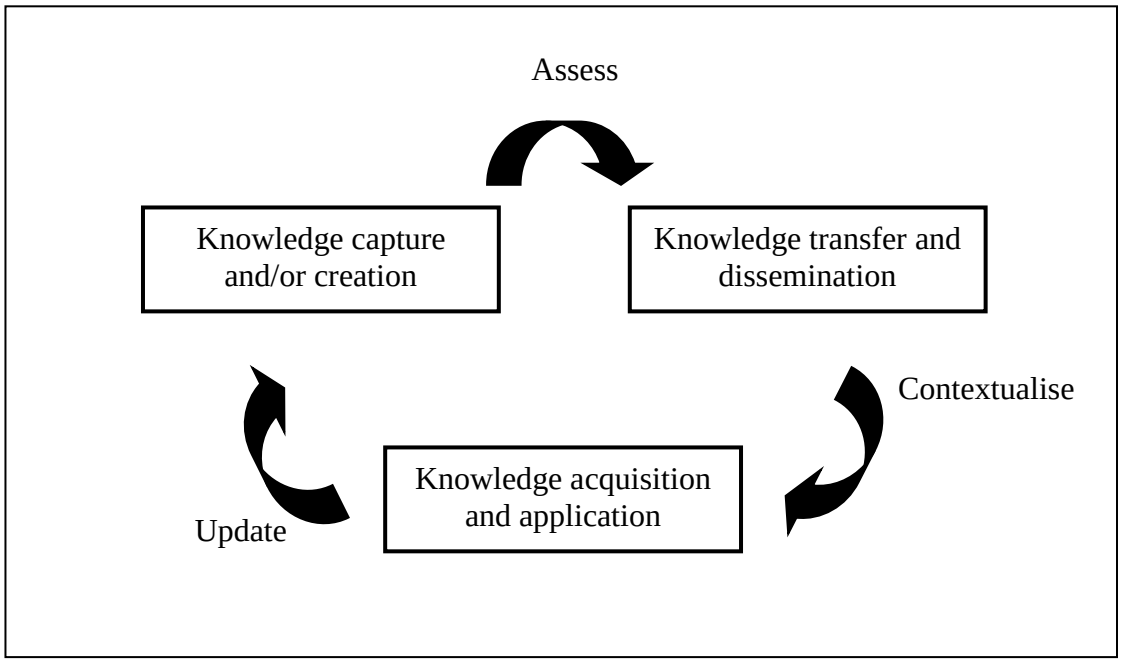

Figure 2-1. An integrated KM cycle

Abell and Oxbrow (2001) explain that knowledge management is the creation and subsequent management of an environment that encourages knowledge to be created, shared, learnt,

enhanced, organised and utilised for the benefit of the organisation and its customers. Moreover, knowledge management draws upon a number of fields that are as follows:

- Information technologies such as knowledge-based systems, document and information management, electronic performance support systems, and database technologies
- Collaborative technologies such as Computer-Supported Collaborative Work (CSCW) and groupware as well as intranets, extranets, portals, and other web technologies

Although the term 'knowledge management' formally entered popular usage in the late 1980s (e.g., conferences in knowledge management began appearing, books on knowledge management were published, and the term began to be seen in business journals), philosophers, teachers, and writers have been making use of many of the same techniques for decades.

Dalkir emphasises that knowledge management is not solely transferring and sharing right information to the right people at a certain time and it is not another term for managing information. He explains that KM is social in nature and for that reason human and social factors must be considered in KM approaches (2011). Thus, knowledge is never totally neutral and unbiased and is, to some extent, inseparable from the values of those who created it (Hislop, 2013). Alvesson and Kärreman (2001) developed a framework for the four different categories of knowledge management approaches (see Figure 2-2).

Mode of managerial intervention

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Figure 2-2. Typology of knowledge management approaches (Alvesson and Kärreman, 2001)

Popper (1979) proposed that there are three worlds ontology for Knowledge Management to analyse the interaction between the objects developed by human mind, mental processes and material world. He refers to the world of material objects, reality and events as world 1, mental events and routes as world 2 and conceptual theories, ideas and knowledge as world 3. In 1988, 'The design of knowledge-building environment' project funded by Apple Computer

initiated the development of knowledge building model by Bereiter (Scardamalia and Bereiter, 2010). In 1994, Scardamalia *et al.* (1994) made a conceptual distinction between Intentional Learning (popper's world 2) and Knowledge Building (popper's world 3) (Scardamalia *et al.*, 1994). Scardamalia and Bereiter (2010) explain that Intentional Learning involves intentional development of skills while Knowledge Building involves knowledge creation and improvement of a domain's knowledge. Scardamalia and Bereiter (1994) proposed the concept of Knowledge Building as collective knowledge required for expansion of conceptual artefacts including the development of theories, strategies, ideas, plans and model for business improvement. They explain that their model facilitates collaborative knowledge creation through creating new professional knowledge by engaging professionals in collaboration.

Scardamalia and Bereiter (2010) developed principles of knowledge building that are as follows:

- Real ideas, authentic problems. Individuals have the need to understand the world and this creates knowledge problems that lead to developing ideas and creating reactions.
- Improvable ideas. This principle of knowledge building revolves around assuming that the quality of all ideas, the way they are communicated with other people and the way it will be utilised are improvable.
- Idea diversity. Knowledge building can be more effective with availability of idea diversity and for that reason; idea diversity is fundamentally required for development of new knowledge. It supports improving and enriching ideas through allowing comparison between different perspectives and facilitating combining ideas.
- Rise above. Investigating the factors that has significant impact on development of current problems facilitates better and higher level of understanding the problem followed by creative knowledge building.
- Epistemic agency. Participants in knowledge building contribute to the success of the collaboration through being responsible for sharing all the relevant ideas they have and accepting that diverse ideas is beneficial for creation of new knowledge.
- Community knowledge. It is important to distinguish personal learning from knowledge building that facilitates creating new knowledge of value to others.

- Democratising knowledge. This principle of knowledge building values all the participants as contributors to creation of the new knowledge and it follows the rule of empowering all the different and diverse stakeholder groups to engage in knowledge innovation.

- Symmetric knowledge advancement. It is important to facilitate knowledge transfer between all the stakeholder groups who have problem-related knowledge regardless of the degree of the groups' knowledge in their domain.

Spender and Grant (1996) developed the knowledge-based view (KBV) of the organisations. They clarify that KBV approach facilitates identifying cognitive abilities and combining distinctive knowledge resources to support knowledge creation. Kim *et al.* (2014) emphasise that KBV identifies two key KM dimensions that are the type and origin of knowledge. The relationship between KM strategies and two key KM dimensions is shown in Table 2-1.

Table 2-1. Key dimensions of KM strategies

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Bhatt (2001) refers to knowledge management as a process with five coordinated phases (see Figure 2-3) that assist the organisations to learn, reflect and unlearn and relearn. These phases are as follows:

1. Knowledge creation

The capability of an organisation to develop new ideas and solutions through interactions between functions or individuals with problem-centred knowledge represents the concept of knowledge creation.

2. Knowledge validation

The extent to which an organisation can reflect on knowledge and evaluate its effectiveness for the current organisational environment represents the concept of knowledge validation.

3. Knowledge formatting (knowledge presentation)

Organisations use different methods to format and present their knowledge which is referred to as knowledge presentation. Different units within organisations require different means and mediums of knowledge presentation and for that reason, diverse individuals/groups often find it difficult to reconfigure and integrate knowledge from these distinct sources.

4. Knowledge distribution

The organisations need to distribute and share knowledge throughout their firms in order to derive benefit from knowledge at organisational level.

5. Knowledge application

The concept of knowledge application revolves around making knowledge more active and relevant for the firm in creating value.

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Figure 2-3. Knowledge management process activities (Bhatt, 2001)

2.3.2. Definition of knowledge in knowledge management context

Understanding what knowledge is might sound very basic and intelligible; however, it has been interchanged with some terms (data and information) which have totally different concepts than knowledge has. This highlights the importance of emphasizing on differentiating between what knowledge is and what it is not. In this research, knowledge is differentiated from data and information to ease the clarification of what it is, and the reason of confusing it with data and information is investigated.

It is very easy to confuse data with information, information with knowledge and knowledge transfer with information sharing. Bierly III *et al.* (2000), Faucher *et al.* (2008), Freeze &

Kulkarni (2007), Gurteen (1998), Hicks *et al.* (2006), and Newman (1997) emphasise on the significant difference between data, information and knowledge. They all evaluate data as raw facts (numbers, words, images, sounds, etc.) or in other words, distract trials which are derived from facts, measurements or observations. Information, in comparison, is processed data or patterned data which represents arranged data in a meaningful pattern. These two descriptions show that in contrast with information, data by itself does not consist of intellectual aspects because it does not require any analysis or understanding. However, information is an intellectual input combined with data which would represent a meaningful pattern for data. Newman (1997) states that although data exist in infinite volume, its transition to information remains problematic. He explains that information does not imply being informed, it means putting data in a sequence or pattern. Gurteen (1998) has the same opinion as Newman (1997), and he states that 'A more useful definition of knowledge is that it is about know-how and know-why.' Moreover, Newman refers to knowledge as an opportunity. He believes that an opportunity is that knowing what had happened in past combined with style of thinking about the future. Consequently, what is mostly required from knowledge is to not only ease the decision making but also making the right decision through minding the future results of that decision. In other words, knowledge should reduce the uncertainty in decision making by improving practical insight. Freeze and Kulkarni (2007) affirm that if data, information and knowledge are not distinguished and the link between them is not recognised, knowledge management does not provide anything new to the organisation.

The above discourse showed that data and information are neither knowledge nor types of knowledge. They are building blocks of knowledge. Gurteen (1998) emphasises on the link between information and knowledge. He credits that in order to make knowledge productive, the existence of information and appropriate use of it is required and it is almost indisputable and undeniable. Therefore, data, information and knowledge are connected, as alphabet and words are, and unless they are linked optimally there might not be any reliable outcome. Alphabet (data: raw facts) do not have much use unless they are put together to form words (information: patterned data). It does not denote that alphabet does not have value and it does means that a word cannot be formed without alphabet (the link between data and information). Furthermore, understanding the meanings of words, why and how to use those words, how to connect the words to form a meaningful sentence, etc. requires knowledge. Faucher *et al.* (2008), and Hicks *et al.* (2006) remark that for generating data/information

knowledge is an essential requirement, it is a prerequisite. In the researcher's opinion, the confusion between the three happens because of the strong link between them and more importantly the intangible layer of 'knowing what' combined with 'knowing how/why' (E.g. knowing what data must be collected or how to sequence the data).

Hicks *et al.* (2006) suggest that using words facts, influences, and solutions instead of data, information, and knowledge might decrease the confusion regarding these terms.

In an organisational context, for instance, data is structured and detailed inputs of the internal customers (e.g. employees), external customers, products, services, etc. The data by itself is relevant to the organisation's inputs and outputs and it is recorded based on the organisation's purposes. In details, specification of products/ services, employees' background and roles, customers' details, each department's activities etc. are stored data in an organisation which is relevant to the purpose of the organisation but it does not provide any interpretation. On the other hand, information has an impact on the interpretation where it is required to sequence the data. A simple pattern is considering an employee's background in order to give the employee an appropriate position in the relevant department or aligning the products specification with the end customers' needs. Consequently, knowing how to sequence data requires the knowledge of doing it in order to achieve an optimal outcome. This example illustrates the intangible role of knowledge hidden in the process which is gained by time and experience and it proves the existence of a very strong link between data, information and knowledge while they have different concepts which are not interchangeable. This link is illustrated in Figure 2-4.

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Figure 2-4. The link between data, information and knowledge (adopted from Hawryszkiewycz, 2010 p. 73)

Some authors' opinions about data, information and knowledge is shown in Table 2-2, it shows that while data is simply clarified, definitions of information and knowledge are not easy to capture or are not distinguished precisely except in Gurteen's (1998) definitions.

Table 2-2. Alternative definitions of data, information, and knowledge

Author	Data	Information	knowledge
Bierly III *et al.* (2000)	Raw facts	Meaningful, useful data	Understanding of information and their associated patterns
Faucher *et al.* (2008)	Unprocessed raw representations of reality	Data that has been processed in some meaningful ways	Information that has been processed in some meaningful ways
Freeze and Kulkarni (2007)	summarized facts or figures obtained from operations, experiments, surveys, etc.	Results from placing data within some meaningful context and can be viewed as processed data	Depend on the context existing for which guidance is desired
Gurteen (1998)	Constituents	The data has been given context	Know-how and know why

Faucher *et al.* (2008) comments that knowledge is processed information in meaningful ways. However, this does not illustrate the true concept of knowledge; in the researcher's opinion,

processing information would only provide a new set of information. Moreover, although Bierly III *et al.* (2000) differentiate knowledge from data and information, they define information as a meaningful, useful data. Moreover, Hicks *et al.* (2006) state that information that becomes actionable is knowledge. This is in contrast with differentiating information from knowledge for the reason that Hicks *et al.* statement shows that they believe that information is type of knowledge in which the action is added to information. Faucher *et al.*, Bierly III *et al.* and Hicks *et al.* point of view and use of words show that, understanding the meaning of knowledge and proper use of this word remains a challenge as Newman (1997) and Gurteen (1998) raised important issues regarding to this challenge more than a decade ago.

Faucher *et al.* (2008) suggest that knowledge is 'procedural understanding of existence'. Bierly III *et al.*, (2000) note that knowledge is about understanding the information. Conversely, Gurteen (1998) argues that referring to knowledge as richer form of information is not authentic. Knowledge is what is learnt through an experience and where acquired and applied precisely, it would carry the solution for the similar events. In Dalkir (2011) words, knowledge is '*Subjective and valuable information that has been validated and that has been organized into a model (mental model); used to make sense of our world; typically originates from accumulated experience; incorporates perceptions, beliefs, and values.*' Knowledge has roots in experience which might have roots in one or two of: thoughts, tests, observations, and other experiences. Thought or an idea is in a person's mind or it is documented, it is processed and hacked in the person's brain or it is like a theory which is documented in a book. It cannot be reliable unless it is brought to reality; for that it should be tested in particular situations, and observed, which in combination will form an experience. This is when although each of these process require 'knowing what', only the experience can provide 'knowing how/why' which can be counted as knowledge.

2.3.3. Different types of knowledge

Polanyi (1962) clarifies that tacit knowledge, in a philosophical context, is embedded in individual's mind and action that has personal quality and is not easy to communicate. He clarifies that explicit knowledge, on the other hand, refers that is easy to communicate because it can be transferred from an individual to another through the channel of systematic language. Nonaka (1994) affirms that tacit knowledge has both cognitive and practical characteristics. Johnson-Laird (1983) explains that cognitive characteristics or 'mental

models' represent the analogies that individuals create and manipulate in their minds that develop individuals' perspectives. Nonaka (1994) affirms that the tacit knowledge has practical characteristic that involves the individual's knowledge and skill of applying that knowledge to particular contexts.

Wijnhoven (2006) clarifies that in addition to tacit and explicit knowledge, implicit knowledge can be understood as the third type of knowledge (see Table 2-3). He explains that tacit knowledge cannot be expressed; explicit knowledge is expressed or could be expressed without attenuation and implicit knowledge is latent which could be expressed but is not expressed because expressing it without attenuation is difficult. The difficulty to express implicit knowledge without attenuation usually is because this type of knowledge resides in the sub-consciousness.

Table 2-3. Different types of knowledge (Hawryszkiewycz, 2010)

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2.3.4. Knowledge boundaries

Carlile (2002) remarks that knowledge boundaries are critical challenge of CKC, however, it may promote innovative problem-solving across stakeholder groups. He developed a typology of knowledge boundaries distinguishing between three distinctive types of knowledge boundaries that are as follows:

1. Syntactic boundaries are assumed to be the easiest to work across as people share a common logic, set of values and worldview. Thus working across a syntactic boundary involves the relatively straightforward process of transferring knowledge and information from one individual/group to the other.

2. Semantic boundaries are more difficult to work across, as with them people do not have a shared logic or set of values. Instead in such contexts people will have different understandings and interpretations of the same knowledge. In such contexts, successfully working across a semantic boundary involves people developing an understanding of and sensitivity to other people's understanding and interpretations.

3. Pragmatic boundaries are the most complex and difficult type of boundary to successfully work across. In such contexts not only do people have different interpretations and understandings of issues/events, they also have different interests, and working successfully across a pragmatic boundary thus involves both developing some common, shared interests and (at least) one group being prepared to change and transform their knowledge. Due to the extent to which people and groups develop a sense of investment in and commitment to their knowledge/practices, doing so is typically never straightforward.

Table 2-4 includes the summary of Carlile's (2000) approach to spanning knowledge boundaries.

Table 2-4. Spanning knowledge boundaries (adopted from Carlile, 2002)

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2.3.5. Collaborative Knowledge Creation

Process of knowledge creation

Nonaka first introduced the four patterns of knowledge creation in 1991 as from tacit to tacit, from explicit to explicit, from tacit to explicit and from explicit to tacit (Nonaka, 1991). Nonaka developed the four modes (SECI) of knowledge creation in 1994 (Nonaka, 1994). In 1995, Nonaka and Takeuchi added content of knowledge to the SECI model (Nonaka and Takeuchi, 1995). The four modes and contents of knowledge are as follows:

1. From tacit to tacit – Socialisation (Sympathised knowledge): the process of creating tacit knowledge is Socialisation. In this process, tacit knowledge is mainly created through sharing experience between individuals. This mode of conversion facilitates individuals to convert tacit and create tacit knowledge through interaction. Socialisation does not necessarily require common language between the individuals because observation followed by imitation can assist the individuals in learning and creating practice. The characteristic of socialisation enables the individuals to share skills, experiences and mental models that are the elements of sympathised knowledge.

2. From tacit into explicit – Externalisation (Conceptual knowledge): this process of knowledge conversion involves both tacit and explicit knowledge and facilitates mutual interaction between individuals. Externalisation yields conceptual knowledge and mainly includes conversion of tacit knowledge into explicit knowledge and is a critical element of effective knowledge transfer.

3. From explicit to tacit – Internalisation (Operational Knowledge): this process of knowledge conversion involves both tacit and explicit knowledge and is very similar to the process of learning from experts. It involves conversion of explicit knowledge into tacit knowledge and outputs operational knowledge.

4. From Explicit to explicit – Combination (Systemic knowledge): the process of creating explicit knowledge from explicit knowledge is Combination. This mode facilitates knowledge transfer between individuals through meetings and discussions. Adding, sorting and re-contextualisation of explicit knowledge in this process supports knowledge creation. The use of models and prototypes in this process shape the systemic knowledge.

This relationship between the four modes (SECI) of knowledge creation is illustrated in Figure 2-5.

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* *Ba* (shared space) is a place where information is interpreted to become knowledge – the shared space for interaction (Nonaka *et al.*, 2001 – see table (ba and knowledge conversion))

Figure 2-5. SECI process (adopted from Nonaka and Takeuchi (1995))

Nonaka et al, 2001 suggest that the type of *ba* (shared space or context) that facilitates and supports each type of knowledge conversion is likely to be different. Hislop's (2013) explanation of the characteristics of *ba* for different SECI conversion modes are included in Table 2-5.

Table 2-5. *Ba* (shared space or context) and knowledge conversion (Hislop, 2013)

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One of the examples used by Nonaka and Takeuchi (1995) explains the need for expert baker experience and skills required in addition to developers and engineers' skills in developing automatic machines for home bread making. They emphasise that tacit knowledge of kneading skills from bakers had significant influence on the beginning of the innovation. This example illustrates the inevitable need for external tacit knowledge in intra-organisational knowledge creation. Figure 2-6 shows the process of interaction between the organisation and outside constituents to create knowledge.

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Figure 2-6. Knowledge creation with outside constituents (Nonaka *et al.*, 2001 p 21)

Bolisani and Scarso developed their inter-organisational model following Nonaka and Takeuchi SECI model in 1999 (Bolisani and Scarso, 1999). The model developed by Bolisani and Scarso assists knowledge transfer across stakeholder boundaries and it facilitated knowledge creation that all the participating stakeholders benefit from. The enriched model developed by Bolisani and Scarso covers the inter-organisational process of knowledge conversion:

1. From tacit to tacit knowledge – At the inter-organisational level, the sharing experiences and expertise has significant influence on collective learning and it facilitates better understanding of area of work of each stakeholder group.

2. From tacit into explicit – This process facilitates better understanding of each stakeholder group perspective and supports collective knowledge within a specific domain. This type of conversion helps the stakeholder groups to better understand the effects of a problem on different sectors within the domain and can support the effectiveness of knowledge creation.

3. From explicit to tacit – This process supports transforming perspectives and experiences into a mutual vision.

4. From Explicit to explicit – Combination (Systemic knowledge) the process of creating explicit knowledge from explicit knowledge is Combination. This mode facilitates knowledge transfer between individuals through meetings and discussions. Adding, sorting and re-contextualisation of explicit knowledge in this process supports knowledge creation. The use of models and prototypes in this process shape the systemic knowledge.

Porter defines that, inter-connected companies that compete and cooperate within dependent industries form the regional cluster that includes service providers and their customers (1998). Pöyhönen and Smedlund (2004) developed the model of inter-organisational networks that contribute to collaborative knowledge creation within a regional cluster. In their model, they identified the collaboration network and its relationship with knowledge creation. They clarify that new knowledge creation is the aim of collaboration network within which participating actors collaboratively develop new solutions for problems. They categorise the characteristics of collaboration network that are as follows:

- The structure of collaboration environment

  The collaboration network should have flexible structure and it should not be too formalised to facilitate creative environment. This allows creation of knowledge that is novel for all the concerned participants in the network.

- Type of knowledge required

  To facilitate the creation of radically new knowledge, it is required to engage different stakeholder groups from different sectors who have specialised knowledge regarding the specific problem in the domain.

Characteristics of knowledge creation

In addition to converting tacit knowledge into explicit knowledge, Nonaka and Takeuchi (1995) categorise the characteristics of knowledge creation into three categories: express the inexpressible, Disseminate knowledge, Ambiguity and redundancy.

- Express the inexpressible

  This characteristic is the first stage of knowledge creation and involves using figurative language to presents and share perspectives. They emphasise that figurative

language can take the form of analogy or metaphor to facilitate creating common understanding between individuals with different identities. This characteristic will be described more in section 4.2.1.

- Disseminate knowledge

  It is the individual's knowledge shared with the group that creates group knowledge; therefore, collaborative knowledge creation is the result of transforming individual's knowledge into group knowledge through effective interaction between the group members. The key challenge associated with this characteristic is creating shared context among individuals who have conflicting perspectives.

- Ambiguity and redundancy

  Ambiguity helps the group in creating a source of alternative that promotes clear sense of direction to the group. Redundancy facilitates transfer of tacit knowledge between participants through supporting the creation of common cognitive understanding of the context.

Characteristics of knowledge creation environment

Scharmer (2008) remarks that collaborative knowledge creation has deliberate focus on creating a sharing space to facilitate participants' involvement in creating new solutions. Hassan (2014) refers to collaborative environment as social lab platform and identifies the core characteristics of social labs that are as follows:

1. Social. Peschl and Fundneider emphasise that knowledge creation does not solely depend on one individual's knowledge; it requires teamwork and is the result of knowledge transfer between experts and is challenging social process (2014). Collaboration environment provides diverse stakeholder groups, who have convergent problem-centred knowledge in a domain, with the opportunity to work together as a team of experts on finding solution for the problem in their domain. This participation of diverse stakeholders represents the social nature of collaboration environment. The collaboration environment facilitates series of integrated problem-oriented conversations and subsequent knowledge transfer between the stakeholders.
2. Experimental. Collaboration environment assists the team of experts in addressing the problems in their domain through creating and managing collection of credible

solutions that is ongoing effort and reflects the experimental nature of collaboration environment.

3. Systemic. Involvement of stakeholders with problem-centred knowledge and different identities in the collaboration environment facilitates developing ideas and initiatives that help addressing the root causes of current problems in the domain. Going beyond solving only one part of the problem is systemic in nature.

The positive influence of these characteristic on the efficiency of collaboration is significant and each one of these characteristics is necessary for the success of the collaboration. Moreover, succeeding in continuously merging the three during the collaboration improves the value of the collaboration significantly. However, in fact none of the characteristics is easy to maintain. This adds to the challenges associated with facilitation of collaboration environment.

2.3.6. CKC approaches applied as part of KM initiatives

Davenport (2014) emphasise that identifying collective knowledge, efficiently using it and creating new knowledge when required are essential for organisation's sustainability. He affirms that knowledge work requires collaboration across the stakeholder boundaries. Dalkir (2011) defines that collaboration is '*A coalition of diverse people with diverse values and expectations working together at the community level to solve problems; a social skill involving working together with two or more persons. Collaboration is the process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own*'. Salisbury (2008) emphasises that while a lot has been written about managing the knowledge of organisations, little progress has been made on the problem of identifying the 'right' knowledge for the 'right' people at the 'right' time – especially in the phase of collaborative knowledge creation.

Burke (2011) remarks that in the field of knowledge management, 'collaborative knowledge creation' represents the concept of dynamic practices and activities at individual, social and organisational levels that assist accumulating required knowledge from different domains to solve complex problems. Reid (2003) affirms that collaborative knowledge creation assist organisations in developing solutions that promotes competitive advantage. Nonaka and Takeuchi (1995) clarify that new knowledge is a critical and essential resource that provides the organisation with competitive advantage. They emphasise that knowledge creation – the

capability to create new knowledge, disseminate it throughout the different units within and across organisations and incorporate it in products, services and systems – may be a key success factor.

Within the KM initiatives, a range of CKC approaches have been applied within and across organisations and the key ones are as follows:

1. Technology-based approaches that consist of computer-supported collaborations can assist, to some extent, aspects of sharing tacit knowledge through visual modelling language (Batatia *et al.*, 2012). Bhatt (2001) remarks that technologies can contribute to the efficiency of problem-centred knowledge flow between different units within or across organisations, however, it cannot support combining multiple views on the interpretations of the causes of the problem and creating solutions. Therefore, technologies can capture knowledge but to manage knowledge in order to create knowledge, organisations need to create an environment that motivates participation, coordination and knowledge creation.
2. People-based approaches. The people-based approaches that identified by this research as most relevant to CKC are as follows:
   - Knowledge elicitation interview

     Gavrilova and Andreeva (2012) remark that interview is a specific method of communication between researchers and people who have problem-centred knowledge that helps the researcher to gain better understanding of issues related to a specific knowledge area. Interview is a popular knowledge elicitation approach because it is easy to conduct, however, efficiency of interviews depends on interviewing capabilities of the interviewer and communication expertise of interviewee.

   - Social interaction

     Dalkir explains that social interaction is excellent vehicle both for capturing and then subsequently sharing tacit knowledge. Social interaction is a detailed narrative of management actions, employee interactions and other within or across organisations events that are communicated informally (2011). Through social interaction, individuals share their understanding of a certain problem and collectively develop the solution. Therefore, there is a strong relationship

between the success of knowledge creation process and characteristics of effective and efficient social interaction.

- Collaborative leadership

  Archer and Cameron (2012) emphasise that to get result across organisational boundaries collaborative leadership is required. They explain that collaborative leadership assist gaining value from the differences in knowledge and expertise that exist in the organisations that are either side of organisational boundaries.

Other people-based initiatives such as communities of practice may also have positive influence on collaborative knowledge creation. Jakubik, explains that knowledge emerges in social context and the advantage of communities of practice is that it involves interaction between individuals with shared expertise or knowledge (2008). This advantage is absent in collaborations between stakeholder groups with different expertise or knowledge, therefore, knowledge creation in this type of collaborations includes knowledge transfer boundaries (Mains and MacLean, 2017). Consequently, these types of initiatives do not fit the definition of CKC approaches outlines above and the review in this chapter does not cover them.

2.3.7. Limitations of existing approaches to CKC in the field of KM

Morris (2013) remarks that participation of different and diverse stakeholder groups in problem solving approaches can have both positive and negative effects on the process and outcomes of the approaches. He emphasises that clarifying the factors associated with stakeholder engagement that affects the success or failure of collaborations should be the priority in developing and implementing collaboration with stakeholders.

Based on the review of the literature on this topic, the key challenges associated with approaches to CKC in the field of KM can be structured in the following categories:

1) Motivation

Factors such as lack trust, self-efficacy, and unified outcome expectations have negative influence on maintaining successful knowledge creation activity through technology-based approaches (Kang *et al.*, 2017).

In people-based approaches, there are number of reasons for lack of motivation to contribute to knowledge creation, including the following:

- Conflicting priorities

  Breese (2012) affirms that conflicting priorities is one of the problems related to gathering stakeholder groups. Bosch-Rekveldt *et al.* (2011) explain that different stakeholder groups have varied expectations and desires that add to the complexity of engaging stakeholders in collaboration. Morris (2013) emphasises that clarifying the purpose and benefits of the collaboration for stakeholder groups expands their willingness to engage in collaboration.

- Impact of knowledge diffusion across boundaries

  Stakeholder groups have the sense of protecting the deployment of the group knowledge across boundaries. Ernst and Chrobot-Mason (2010) emphasise that to achieve effective collaboration across boundaries, collaborative leader need to supports the stakeholder groups' engagement in collaborative problem solving in line with maintaining intergroup satisfaction with the knowledge creation practice.

- Lack of transparent environment

  Transparent problem solving environment facilitates learning about different effects of the problem on each stakeholder groups and their concern through sharing experiences. Ernst and Chrobot-Mason (2010) asserts that transparent collaboration environment within which stakeholders learn about other groups' values, priorities, expertise and needs improves creating collaborative solution. Lumsden *et al.* (2010) emphasise that it is important that in the process of collaborative knowledge creation, individuals agree on what specific concepts mean for them. Because words are abstract and individually meant, members must offer personal interpretation of ideas. As they listen, question and analyse together, they begin to adapt to one another's understandings and negotiate meanings with which they can work (see Figure 2-7).

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Figure 2-7. The process of negotiating among members (Lumsden *et al.*, 2010 p 208)

2) Diverse characteristics of participants

Ernst and Chrobot (2010) remark that diverse characteristics of participants have negative influence on the effectiveness of CKC. Some of these characteristics are as follows:

- Limited sense of shared characteristics
- Insufficient common problem-centred knowledge
- Weak sense of shared characteristics
- Distinctive and separate identities
- Different value systems

One of the most challenging boundaries – which involve characteristics and relationships – is stakeholder boundaries which adds to the difficultly of CKC. Ernst and Chrobot (2011) explain that stakeholder boundaries create divides between the organisations.

Szulanski (1996) categorises the interconnected knowledge creation barriers into three groups that are as follows:

- Characteristics of knowledge
    - Causal ambiguity – difficult to determine failure or success factors of utilising the knowledge in a new setting
    - Unproven – unproven value of knowledge adds to the difficulty of selecting knowledge to be transferred and acceptance of it by recipients
- Characteristics of the source of knowledge
    - Lack of motivation – losing ownership, losing position and unclear benefits of sharing knowledge adds to the unwillingness of knowledge sources to sharing their knowledge
    - Not perceived as reliable – when the knowledge source is not recognised by recipients, it is more difficult to initiate the knowledge transfer
- Characteristics of the recipient of knowledge
    - Lack of motivation – some recipients might prefer to only rely on their own knowledge and for that reason they are reluctant to receiving and accepting knowledge from any other source
    - Lack of absorptive capacity – some recipients might be unable to utilise new knowledge
    - Lack of retentive capacity - some participants fail to apply continuous process of knowledge transfer and cannot succeed in the integration stage of knowledge transfer process

2.3.8. Evaluating success of CKC strategies in KM initiatives

Anantatmula and Kanungo (2011) define the success of KM initiatives as effective collaborative knowledge creation that improves the effectiveness of organisations. However, the evaluation of KM initiatives has been influenced by the immediate, medium or long term usability of the outcomes. Bhatt (2001) explains that to implement KM initiatives, organisations need to accept change in the organisational philosophy. Davenport *et al.* (2001)

remarks the collaboration within and across many organisations has been based on transaction cost economies which is in contrast with KM philosophy whose emphasise is on learning collaboratively that assist organisations with adding value to their products and services for the customers.

Jennex *et al.* (2009) propose four dimensions for measuring the success of KM initiatives that are as follows:

- The impact on business processes
- The impact on KM strategy
- Leadership or management support
- Knowledge content

Therefore, as Jennex *et al.* (2016) clarify, defining the success of KM initiatives is difficult and many organisations fail to address the challenges associated with the evaluation of the actual CKC that takes place as a result of their KM initiatives.

2.4. Areas that have addressed collaborative knowledge creation

Engaging stakeholder groups with problem-centred knowledge in collaborative knowledge creation and problem-solving has been the focus of research and practice in different area. The review in this thesis does not revolve around knowledge creation in the field of formal education or how individuals learn. In contrary, the review in this section focuses on a number of areas that attempt to assist individuals and workgroups to engage in knowledge creation with the aim of addressing complex problems that requires knowledge and expertise from different stakeholder groups. Therefore, this review covers the fields that have informed the proposed new approach to CKC by this research that are information system, organisational learning, collaborative learning, training and development programmes, action learning and collaborative leadership.

2.4.1. Information system

Information system helps the organisations collect, store and communicate information. Therefore, IS can help the organisations to learn from their customers and other stakeholder groups in order to improve their performance. This role of IS is essential and required for product/service improvements, but it is not easy to succeed in implementing effective IS.

Integrating IS in addition to integrating people and process in KM approach involves considering the KM practices in the designing, capturing and implementing of intellectual infrastructure of the organisations. Kim *et al.* (2014) remark that the investment on technologies to increase the effectiveness of the firms' operation process and information system still face the complexity of relating the support from these technologies to knowledge transfer improvement and problem-solving efficiency for many firms.

The collaborative knowledge creation issues in the field of information system

Jurisica *et al.* (2004) remark that information science is one of the foundation fields of knowledge management and it has also been building on technologies of information system. They clarify that although the benefit of IS for organisations in terms of managing storing and distributing vast amounts of information, there are many significant challenges associated to it. Schultze and Leidner affirms that the fields of information system and collaborative knowledge creation are interconnected; therefore, it is important to investigate the implications of different discourses in the field of knowledge and collaborative knowledge creation before developing and implementing information system (2002). Therefore, the lessons learnt from the field of IS can add value to the new approach to CKC proposed by this research.

Knowledge creation approaches used in the field of information system

Deetz's developed the four scientific discourses framework in 1996 (Deetz, 1996) which can be used to understand the IS-based knowledge management. These discourses are as follows:

1. The normative discourse. The normative discourse reflects modernity with its assumptions of progressive enlightenment as well as increasing rationalization, management, and control
2. The interpretive discourse. The interpretive discourse describes the active social interaction and sense-making of people view of organisational activities.
3. The critical discourse. The critical discourse includes addressing fields of continuous conflicts and political struggle
4. The dialogic discourse**.** The dialogic (postmodern) discourse focus is on the constructed nature of reality and the role of language in this construction process.

Evaluation of success of Knowledge creation approaches used in the field of information system

Gregor and Benbasat (1999) remark that it is important to consider the inclusion of explanations in the design of IS to facilitate knowledge transfer or transfer which should follow the normative discourse in terms of implementation of IS.

2.4.2. Organisational learning

According to Crossan *et al.* (1999) 41 model (see Figure 2-8), organisational learning involves a tension between assimilating new learning (exploration) and using what has been learned (exploitation). Individual, group and organisational levels of learning are linked by the social and psychological process of intuiting, interpreting, integrating and institutionalising (The four I's).

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Figure 2-8. The 41 model of organisational learning (Crossan *et al.*, 1999)

Alavi and Leidner suggest that the process of knowledge transfer and the process of organisational communication are very similar (2001). Teece (2000) remarks that the ability of organisations to create, share and utilise knowledge assets, promote competitive advantage of the organisations. He clarifies that knowledge and expertise exists within segmented units

of organisation and to create/improve new product/service or to solve problems often skills and knowledge from different units are required, consequently, integration of some units and creation of knowledge transfer channel between units is essential. The same rule applies when knowledge from different organisations within one domain is required. Bstieler *et al.* (2017) and Huber (1991) remarks that learning at organisational level involves the accumulation of individuals' knowledge shared with other individuals within an organisation and inter-organisational learning revolves around the same theory that involves the accumulation of different organisations' knowledge shared with other organisations within one domain.

Knowledge creations models in the field of organisational learning

1) Learning model by Levinson and Asahi

Levinson and Asahi developed the inter-organisational learning model in 1995 (Levinson and Asahi, 1995). This model identifies the benefits of knowledge transfer across stakeholder boundaries and it identifies the factors that affect the process of knowledge transfer. It illustrates the strong relationship between the communication theories and the theory of inter-organisational learning.

Levinson and Asahi explain that absence of knowledge transfer channel across organisational boundaries has major influence on failure of the projects that need domain-wide knowledge and expertise. They describe two examples of boundary-bridging success and failure. The first example explains that lack of boundary bridging between Bell Atlantics and TCI resulted in failed project. They affirm that the absence of a channel to facilitate knowledge transfer between the two companies before the initial arrangements of the project and during the project resulted in failure of the project. They explain in the second example that knowledge transfer channel between a French company and a U.S. company involved in pharmaceutical alliance facilitated communication between the companies and it contributed to the success of project, considerably (1995). Another example that shows the important role of effective knowledge transfer on the success of projects that need information and knowledge from different sectors of a domain is the failure of one of the French projects reported by CNN (2014). SNCF (a French national railway company) manufactured many trains that could not fit in hundreds of regional stations and the reason was lack of considering all the stations. Engaging more stakeholder groups including infrastructure and operation groups could predict and prevent this failure.

Levinson and Asahi (1995) remark that engaging stakeholder groups across a domain provides the context for inter-organisational learning. It clarifies the patterns and extent of formal cross-organisational boundary spanning. What need to be considered in inter-organisational knowledge transfer are as follows:

- What is the knowledge that stakeholder groups obtain through participating in collaboration with other stakeholder groups?
- How this knowledge is shared (through formal and/or informal face-to-face meetings or through virtual environments)
- In what form the knowledge is shared (presentation, formal meeting and discussion, audio/video communication)
- What factors affect the sharing of knowledge (informal versus formal meetings, frequency of communication)
- How the stakeholder groups utilise the new knowledge (changes in current service/product or developing new solutions)?

2) Learning model by Szulanski

Szulanski (1996) explains that knowledge transfer within firms comprises of a dual process between knowledge source and recipient. He emphasises that the characteristics and identity of individuals involved in knowledge transfer influences the process. In his model of knowledge transfer process, he identifies four sequential stages that are as follows:

1. Initiation. Identifying the relevant sources of knowledge that can contribute to a potential solution and the recipients who can benefit from the knowledge transfer are the difficulties of this stage, in particular when there is no connecting channel between different parts of the firm.
2. Implementation. This stage includes knowledge transfer between the knowledge source and recipient. Creating social links between the knowledge source and recipient happens during this stage through conversation and discussion. It is very important to ensure the knowledge sources understands that there would not be any impairment in sharing their knowledge and ensure the recipients that they will benefit from this new knowledge.

3. Ramp-up. This stage includes utilising the new knowledge by the recipients and it is critical to facilitate effective use of the new knowledge to prevent devaluation of the shared knowledge.

4. Integration. Obtaining meaningful results from the new knowledge by the recipients is the start of the integration stage. The success of knowledge transfer supports the integration stage within which knowledge sources and recipients are motivated to participate in ongoing coordination.

3) Expansive learning model by Engeström

Engeström, in 1999, developed the model of expansive learning to assist his innovative learning cycles in collaborations that is called Cultural-Historical Activity Theory (CHAT). This theory illustrates the strong relationship between individual's behaviour and the socio-cultural context (Engeström, 1999). Engeström's model of expansive learning in collaborations follows the seven cyclic stages of innovative learning cycle that are as follows (Engeström, 1999; Engeström, 2015):

1. Facilitating better understanding of individual participants' perspective on a certain problem

2. Analysing the factors influencing the problem and determining the root causes of problem

3. Facilitating participants' engagement in modelling a new solution

4. Analysing the new model and investigating its benefits and limitations

5. Implementing the new model to investigate its application

6. Reflecting and evaluating

7. Engaging in consolidating the new effective solution

Engeström and his colleagues (Engeström *et al.*, 1995; Ahonen et al, 2000) developed the boundary-crossing laboratory method. This method engages researchers in organisational learning to assist individual groups within a domain in reflecting on their mutual activities.

One example of using boundary-crossing laboratory in expansive learning collaborations is the work of Ahonen et al, (2000) supporting a telephone company in transforming from a

regional monopoly to provider of knowledge-intensive and competitive digital network and mobile connection services. Ahonen et al, explain that boundary-crossing laboratory helped the telephone company to investigate capability of different stakeholder groups, in particular the researchers that can provide significant help in identifying the problems, collectively creating common vision and developing solutions.

2.4.3. Collaborative learning

Laal (2013) explains that learning at the individual level is widely accepted to be a fundamentally social process – something that cannot occur without group interaction in some form. Individuals thus learn from the collective and at the same time the collective learns from the individuals.

Limitations of knowledge creation approaches in the field of collaborative learning

Twigg and Steiner (2002) remark that syntactic and semantic limits are the key challenges associated with collaborative learning. Therefore, successfully spanning syntactic and semantic boundaries, where people do not have a shared syntax or language and where people may have divergent interpretations and understandings is more complex. Carlile (2002) explains that successfully spanning Syntactic boundaries, where people do not have a shared syntax and language, and spanning semantic boundaries where people may have divergent interpretations and understandings is complex. Moreover, as Duffield and Whitty (2015) remark, individuals have distinctive learning techniques, therefore, the efficiency and applicability of what is learnt depends on the individual's capability.

Evaluation of success of Knowledge creation approaches used in the field of collaborative learning

Duhon and Elias (2008) emphasise that to examine the effectiveness of tacit knowledge in learning process, understanding cognitive characteristics of participants is required. Some of the other factors for evaluating the effectiveness of collaborative learning within and across stakeholder boundaries are as follows:

- Collective understanding of focus level

  Level of focus is one of the critical factors in collaborations across stakeholder boundaries. They explain that facilitating the focus at inter-organisational level is difficult when individual groups focus on the factors affecting their organisation

rather than the ones affecting their domain as one whole. They affirm that lack of focus at inter-organisational level has negative influence on the effectiveness of collaboration.

- Structure of collaborative learning within and across organisations

  The influence of the patterns of structure on organisational and inter-organisational learning is significant. A network form represents the connection among the stakeholder groups participating in the collaboration and their connection with relevant stakeholders. This network form can facilitate tracing the knowledge transfer across stakeholders if there is any. It also represents level of connection between stakeholder groups and absence or presence of boundary-bridging leaders.

- Number of different stakeholder groups in the collaborative knowledge creation activity

  The number of different stakeholder groups in the collaborations affects knowledge creation. They explain that there is a strong relationship between the ability of participants to identify a variety of new ideas and number of participants.

- Technology

  Communications technology, to some extent, can facilitate knowledge transfer across stakeholder groups participating in collaboration. Individuals who are connected through telecommunications can obtain better access to new ideas and each of them can in fact play the role of boundary-spanner. Therefore, communication technologies can improve the collaborative learning including reflection process. However, communication technologies can assist or facilitate collaborative learning only to a limited extent. Without person-to-person discussions and face-to-face interactions, achieving effective collaborations is extremely difficult. The prerequisite to participating and engaging in collaboration is the development of respect and trust among the stakeholder groups that are best cultivated through informal and face-to-face interactions, in particular, for problem solving and knowledge creation.

- Absorptive capacity

  Absorptive capacity represents the foundation for both organisational and inter-organisational learning and it is important to understand absorptive capacity of a

domain as a whole. Knowledge transfer that links different and diverse stakeholder groups can facilitate the sharing of absorptive capacity throughout their domain. The most important factor in determining the effectiveness of collaborative knowledge creation is absorptive capacity.

- Spanning syntactic and semantic boundaries

  To successfully span syntactic boundaries, the fact that people have a shared syntax and language, means repository type boundary objects, in the form of common data and information can facilitate cross boundary working. Thus, facilitating effective knowledge transfer across the boundaries supports the development of common, agreed upon and understood by all stakeholder groups.

  Spanning semantic boundaries involves the development and use of boundary objects that facilitate a process of perspective making and taking, where people develop an increased understanding of the perspective of others. Carlile suggest that boundary objects can support achieving this (2002). Models can support the participants to gain insights into the perspective of others via understanding the different ways that common forms are used. Objects/ models support the use of shared drawings etcetera that provides a means via which people's differences in perspective can be communicated and discussed. In addition, maps, which outline the inter-dependencies between communities, can also be used, as they allow groups to understand how people's perspectives are shaped by their community interests and co-dependencies. Thus, with the spanning of semantic boundaries, the primary knowledge process is one of translation.

2.4.4. Training and development

Jaspreet (2016) defines training as a continuous activity that assists employees with gaining required skills and knowledge to improve the efficiency of their performance. Moreover, training help the employees to adopt inevitable changes in their jobs and meet their jobs' requirements. He emphasises that training and development programmes have a positive impact on skill development and knowledge enhancement followed by overall performance improvement.

The effectiveness of training and development programmes can be influenced by many factors that are not easily altered – for example, the work environment. However, some

challenges associated with training and development programmes can be controlled by the trainer or the trainee (Cuadra-Peralta *et al.*, 2017). Therefore, conceptual understanding of the trainee and the ability of trainer to assist the trainee in learning and developing have significant influence on the success of training and development programmes. Figueiredo *et al.* (2016) remark that creating an environment for the trainees to use what they have learnt in solving the problems in their organisation, should be the main focus of the training and development programmes. This is the relevance of this field for the research reported in this thesis.

Knowledge creation approaches used in the field of training and development

Among many training and development programmes, this section provides a brief review of those that have informed the proposed new approach to CKC by this research. These programmes are as follows:

- Learner-centred discussion

  In training and development sessions, it is important to structure and guide the discussions. Barron (2014) remarks that the nature of learner-centred discussions is flexible and this factor promotes creative learning, however, the type of conversation in learner-centred discussion should be selected in relation to discussion objectives. The role of trainees can be active or passive depending on the discussion objectives.

- Brainstorming

  Barron (2014) explains that in brainstorming, a type of discussion method, trainees have the opportunity to take active roles in their training which supports their learning process. Gavrilova and Andreeva (2012) emphasise that the aim of brainstorming method is to facilitate new ideas without any assessment by participants for the reason that assessment hinder creative thinking, therefore, the essence of brainstorming is to divide the process of idea generation from valuation.

Evaluation of success of Knowledge creation approaches used in the field of training and development

Kirkpatrick and Kirkpatrick (2006) remark that evaluating training provides an opportunity to justify the existence and budget of the training department, to decide whether to continue or discontinue training programmes and to gain information on how to improve future training

programmes. Moreover, they describe four levels as a sequence of ways to evaluate programmes that are as follows:

1. Level one – reaction. The evaluation on this level investigates the reaction of participants to the training
2. Level two – learning. The evaluation on this level investigates the extent to which trainees change attitude, improve knowledge and/or increase skill as a result of attending the training programme.
3. Level three – behaviour. The evaluation on this level investigates the extent to which change in behaviour has occurred because the trainees attended the training programme.
4. Level four – result. The evaluation on this level investigates the final result of the training programme in terms of improved performance of the firm, for example in terms of improved quality of product/service.

Chatzimouratidis (2012) describe the evaluation of training and development in five categories that are as follows:

1. Cost. The cost of training and development programmes affects the overall evaluation of the programme. The application of each programme has a certain cost that is difficult to calculate for the reason that several tangible and intangible factors should be used for cost estimation. Economy programmes are usually considered better for the overall evaluation of the programme.
2. Time. In addition to the type of training, skill level and experience of both trainer and trainee are considered in estimation of training time. Since time is one of the most valuable assets for organisations and like cost, programmes that require the least time are usually considered better for the overall evaluation of the programme.
3. Applicability. The most important role of training and development programmes their applicability. Therefore, the greater the applicability, the better the overall evaluation of the programme.
4. Efficiency. The primary criterion for the evaluation of training and development programmes is efficiency. Efficiency of training and development programmes refer to a wide range of results such as improved quality of products or services, increased production or number of service users and improved employee performance therefore, measuring efficiency is not an easy task.

5. Employee's motivation. The training and development programmes creates and environment for the employees to gain new skills and develop career which promotes employees' motivation and retention. Motivation can be measured by level of employee participation in knowledge creation and problem-solving. The degree of motivation has direct influence on the evaluation of the training and development programmes.

The above discourse shows that the relationship between knowledge creation approaches and the approaches to training and development programmes has significant impact on the development of a new approach to CKC in service industry. In particular, the active role of trainees in training programmes that can contribute to knowledge creation and the role of training leader on the effectiveness of training sessions. These approaches have provided significant input to the development of a new approach to CKC proposed by this.

2.4.5. Action learning

Within organisations, action learning (AL) is an important learning and development approach (O'Neil and Marsick, 2014). Rimanoczy and Turner (2008) emphasise that AI is different from other forms of *learning by doing* that involves application and skills in addition to knowledge of facts. This is the relevance of this field for the research reported in this thesis. The key to knowledge creation in AL – as included in the definition of AL by O'Neil and Marsick (2007) in section 2.2. – is that participants work on real project or problem and learn from them.

Marsick and Maltbia (2009) describe the important elements of AL in three phases of action learning conversations (ALCs) that are a critically reflective practice which supports transformative learning through identifying primary values and perceptions to enable participants to understand how they can contribute to solving a problem. As shown in Figure 2-9, these phases are as follows:

1. Framing and engaging. In this phase, participants share their area of development (personal learning goal) to create collective understanding of available essential background experiences of participants.
2. Advancing. This phase is the heart of ALCs process. Question – Storming, exploring assumptions reframing and committing are the four key steps of this phase.

3. Disengaging. Summarising key findings, reviewing commitments and checking for alignment are done in this phase which facilitates the development of feedback loop that feeds the new insight and knowledge back into the way the participants frame and engage the situation through action.

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Figure 2-9. Action learning conversations (ALCs) (Marsick and Maltbia, 2009)

Limitations of knowledge creation approaches in the field of action learning

Barriers that hinder learning from experience including not understanding and recognising one's own perceptions and assumptions, lack of noticing and intervening skills, no established patterns of thought and lack of opportunity to step aside from the experience (Boud and Walker 1996), and participants' impatience and discomfort with practices that may lead to critical reflection (Marsick and Maltbia, 2009) are the main limitations of knowledge creation process within action learning. O'Neil and Marsick (2014) argue that the role of an AL coach is critical as the AL coach creates situations to assist AL participants to overcome these barriers and ensures an explicit focus on learning and problem-solving.

Evaluation of success of Knowledge creation approaches used in the field of action learning

Lamont (2010) explains that AL is an approach to effective problem solving and the essential elements of its process are reflective analysis and critical thinking to motivate effective learning followed by increasing problem-solving ability. Burgoyne (2016) remarks that

evaluation in the field of action learning covers the analysis of the investment in financial or intellectual capital and the analysis of factors that can improve the action learning programme.

2.4.6. Collaborative leadership

Schwarz (2002) emphasises that in this approach the skilled collaborative leader is skilled in process, expert in content and involved in decision-making and these characteristics constitute collaborative leader.

Schwarz (2000) remarks that facilitating participation environment is one of the several fundamental elements of effective collaboration and without collaborative leader, participation might not result in achieving collaboration purpose. Therefore, creating participation environment is a requirement for effective collaboration rather than an end.

In collaborative knowledge creation, collaborative leader is the essential requirement for effectiveness and success of the collaboration. Schwarz (2014) informs that mutual learning is the core element of collaborative leader approach. He emphasises that the mutual learning reduces unproductive conflicts and increases the effectiveness of collaboration. Scharmer (2008) explains that it is important for the collaborative leaders to address the structural habits of attention and interaction that is the result of incorrect habits of listening. He categorises the different types of listening into four types that are as follows:

- Downloading. This type of listening includes reconfirming usual conclusions
- Factual. Individuals pay total attention to other individual's speech without drawing expected conclusion. This type is object-focused listening during which individuals become aware of the differences between their previous knowing and understanding and the current transferred knowledge.
- Empathic. Individuals create deeper level of listening through engaging in real conversation and form the empathic listening. This type of listening supports better understanding of individual's perspective on the impacts of the matter in hand.
- Generative. This type of listening involves willingness to unlearning and developing new knowing. Generative listening and responding is the most challenging factor for leaders and fundamental in investigating and addressing root causes of problems.

Moreover, the role of collaborative leader consists of three levels of facilitating meetings, focused discussions and interaction. The structure of the meetings, type of discussion and level of interaction depend on the degree of participants' familiarity with collaborative knowledge creation. These three levels are as follows:

1. Level one of facilitating meetings – stakeholder input meeting

The role of the collaborative leader is passive at this level. This allows the stakeholder(s) to engage in introducing the knowledge resources that could contribute to CKC without any interfering decision from the collaborative leader. Therefore, the collaborative leader has the role of 'participant as observer', mainly observes, and ascribes the list of relevant and available knowledge resources.

2. Level two of facilitating meetings – collaborative leader(s) interaction

The role of the collaborative leader is active at this level and includes individual-focused consisting of storytelling and observation.

The observation method allows the collaborative leader to closely observe the professional activity of concerned stakeholders. It is important that the collaborative leader clarifies the purpose of the observation for the participating stakeholders and avoids any intrusion into the work of stakeholders. In addition, storytelling provides a communication channel between the collaborative leader and stakeholders. It improves the understanding of the collaborative leader about the required problem-centred knowledge.

3. Level three of facilitating meetings – stakeholder review and reflect meeting

Stakeholders and collaborative leader both have active position throughout this level. It involves collective methods consisting of focussed discussions and brainstorming. Focused discussions supports selecting the stakeholder groups with the most relevant problem-centred knowledge and brainstorming facilitates overcoming the challenges associated with engaging unavailable stakeholder groups or the ones not willing to participate.

Limitations of knowledge creation approaches in the field of collaborative leadership

Leading collaborative knowledge creation involves setting up an environment in which members of different stakeholder groups in a domain meet and collaboratively find solution to the problems that they could not find individually. Lack of effective and efficient

facilitation of knowledge transfer in such environment could result in significant exchange of data rather than problem-centred knowledge. Moreover, Ernst and Chrobot-Mason (2011) emphasises that diversified groups of stakeholder might have different understandings of a given problem and poor leadership of the collaboration would lead to creating a more complex problem rather than developing a solution.

Evaluation of success of Knowledge creation approaches used in the field of collaborative leadership

Ansell and Gash (2012) affirm that the fundamental challenges associated with collaborative knowledge creation are as follows:

- Creating a team of stakeholder groups who have problem-centred knowledge and are willing to learn from and with each other
- Creating and holding collaborative environment
- Facilitating knowledge creation

First, a team of stakeholder groups who have negative or no experience of participation in collaborative problem solving with other stakeholder groups and not willing to learn from and with each other is one of the challenges associated with complexity of collaborative knowledge creation. Therefore, the success of CKC can depend on creating a team of stakeholder groups who have problem-centred knowledge and motivating them to learn from and with each other.

Second, incompatible recognition of the problem-related factors affecting different stakeholder groups in a domain results in conflicts of perspectives and ineffective interaction between stakeholder groups. Consequently, addressing these has significant impact on the success of CKC.

Third, the purpose of collaborative knowledge creation is engaging stakeholder groups in finding a solution for the problem in their domain that minimises the domain-wide effects of the problem and improves performance of the domain as one whole rather than a solution that satisfies the stakeholder groups, individually. Therefore, inspiring the stakeholder to engage in collaborative knowledge creation, that their knowledge and ideas are needed to support the outcome of the collaboration and they will benefit from the outcome, contributes to the success of CKC.

2.5. Summary

The process of knowledge creation has been part of knowledge management since the field originated in 1990s conveying the idea that companies can literally create knowledge that enables them to progress. Development of different approaches to implementing KM initiatives in organisations has been followed by application of a range of CKC approaches including technology-based approaches. Technology-based approaches assist communication between individuals/groups that work in a remote, automated, or isolated manner in which people-based knowledge is less accessible. However, for many reasons, the importance of people-based approaches to collaborative knowledge creation is significant.

Engaging different stakeholder groups who have influence on complex problem in a domain and who are affected by that problem in knowledge creation would not emerge without collaborative environment that addresses the barriers that prevent individuals from engaging in collaborations and the barriers that prevent the success of the collaborations. Although organisations have been implementing number of approaches to CKC, there exist limitations of the CKC processes that are mostly related to:

- Individuals and groups willingness to participate in collaboration and also contribute to knowledge creation
- Diverse characteristics of participants have inevitable impact on their perception and decision about engaging in CKC processes or discarding it.
- Knowledge boundaries hinder effective knowledge creation by different stakeholder groups

In many cases, the organisations expect fast result and evaluate the overall impact of KM initiatives on the organisation instead evaluating CKC processes success and its impact on business improvements in relation to CKC long-term and strategic result.

Review of the existing approaches to collaborative knowledge creation and the limitations of each approach shows that the effectiveness of collaborative knowledge creation has not been fully achieved. These limitations form part of the context of this research. Therefore, the researcher will address these limitations during development, implementation and validation phases of a new approach to CKC in service industry.

CHAPTER THREE

3. RESEARCH METHODOLOGY

The study of the relationship between the concept of knowledge and its influences on the process of collaborative knowledge creation varies in different contexts. The purpose of this chapter is to assist the reader to understand how the researcher will be able to prove that improving the process of engaging diverse stakeholder groups with problem-centred knowledge in knowledge creation can be used as an approach to maintain the effectiveness of collaborative knowledge creation. Consequently, this chapter includes the discussions of research methodology choices adopted in this research to address the research question and its context, as described in chapter one. The discussion comprises 1) research strategy, design and methods, 2) their strengths and weaknesses and 3) the feasibility and competence of the research approach adopted to conduct this study.

3.1. Introduction

The key factors of this research, as discussed in chapter one and two, are knowledge characteristics and collaborative knowledge creation. The research methodology supports the assessment of relevance of data collection and data analysis methods for the purpose of addressing the research questions.

Silverman (2013) describes the structure data collection and data analysis in three categories that are as follows:

1. The theoretical assumptions that shaped the data collection and analysis reported in this thesis
2. The factors that made the author choose to work with these particular data

3. The impact of the overall strategy adopted, the research design and techniques used by the author on the conclusions of the research and the feasibility of generalising from the analysis.

This chapter, briefly describes these areas and chapters five and six focuses on a detailed description of the data collection and analysis processes. Therefore, these areas will be addressed in the body of this thesis as follows:

- The definition of general approach to study the challenges associated with CKC in service organisations will be included in this chapter
- Chapter five describes the specifications of data collection process before reporting the applications of the new approach to CKC
- Following the results of data collected, chapter six presents the specific analytic strategy adopted to assess the new approach to CKC

3.1.1. Addressing research questions

The research questions defined in this thesis suggests investigating existing theories relevant to stakeholder boundary spanning in the field of knowledge management. This research focuses on elements of leadership related to knowledge process in knowledge management area and does not address the financial factors associated with facilitating collaborations.

In this thesis, the researcher investigates practical constructs. In addition to traditional view of corporate social responsibility that focuses mainly on organisational level of analysis and does not include individual or groups perspectives (Orlitzky *et al.*, 2011), this research constitute stakeholder engagement perspective and focuses on two stakeholder groups that are as follows:

- Organisations from two key service industries in the UK
- Captive market (Includes any group that relies on the service provided by the service provider)

Answering the research questions constitute understanding the key dimensions of the research questions. One of these dimensions is to understand individual stakeholder group's perceptions relating the knowledge about problems in their domain that needs to be shared across stakeholder boundaries to support knowledge creation. The two qualitative methods of

collecting primary data, observation to observe the interaction process between stakeholder groups and discussion to understanding each group's perception, are used in this research.

Bryman (2008) explains that although discussion involves words more than numbers, it cannot be precisely confirmed that discussion is only communication of words in the qualitative methodology. Moreover, O'Brien remarks that understanding past events including quantitative and qualitative data has an important influence on understanding current events (2012). Different individual's perception of the past events affects the process using discussion to present comprehension of past events and experiences. Skilful leader of the discussion uses these differences and creates effective discussions around the past events.

3.2. The key concepts that support the conduct of this research

This section presents the descriptions of the terms that support defining the author's theoretical assumptions and identifying the process of data collection and analysis. Silverman (2013) describes these terms in six basic research terms that creates the level of research analysis. The first research term is the author's *mental model* of the research; the second term is *concepts* and it includes the concepts related to addressing CKC in service organisations; the third term, *theories*, revolves around supporting the study of concepts; the fourth term is *hypotheses* that present a testable proposition. The fifth term, *methodology*, describes the general approach to studying research topic. *Research method* is the sixth term that means a specific research technique (e.g. interview, focus group). The specific descriptions of this research terms are as follows:

1. **Mental models**

The researcher understands that the reality surrounding research problem influences investigating the research problem. Such an understanding of reality is referred to in the literature as *models* or *mental models*. Mental models are research paradigms that represent the overall framework for perception of reality of the researcher. Therefore, mental models are instruction to understanding of a particular fact or event and they are self-confirming (Silverman, 2013). Norman (2014) remarks that mental models provide predictive and explanatory ability for understanding the interaction between individuals and environment. Johnson-Laird (1983) explains that cognitive characteristics or 'mental models' represent the analogies that individuals create and manipulate in their minds that develop individuals'

perspectives. Therefore, researcher's mental model has a significant influence on developing the research questions, the data collection and analysis.

Silverman affirms that the fundamental elements of mental models are *ontology* and *epistemology*. He explains that these two elements represent the understanding of the researcher about reality and the concept of knowledge (2013). Bryman and Bell describe that *ontology* of the research includes the explanation of the meaning and basic elements of understanding of reality for the researcher who conducted a particular study (2015). Therefore, a description of the researcher's mental model assists the clarification of researcher's approach to study service organisations as social entities to clarify the influence of external factors on the individuals' involvement in the process of collaborative knowledge creation. Bryman and Bell describe that *epistemology* of the research includes the researcher's understanding of the concept knowledge (2015). Therefore, a description of the researcher's mental model clarifies whether the researcher recognises that qualitative data such as individuals' perceptions could be regarded as acceptable knowledge in the process of addressing the research questions.

2. Concepts

Concepts support the researcher to interpret the ideas that derived from a specific mental model and they are essential in defining a research problem. Concepts, similar to mental models, direct the interpretation of a particular fact or event and they are self-confirming (Silverman, 2013). Moreover, concepts are the building blocks of theory and represent the points around which research is conducted (Bryman and Bell, 2015).

3. Theories

Theories arrange the grouping of concepts that supports the development of a particular definition or explanation of a fact or event and they provide motivation for research. Theories, similar to models and concepts, are self-confirming and they can never be disapproved but the degree of its significance varies depending on the individuals' perception (Silverman, 2013). Myers (2013) explains that to understand the perceptions and intentions of research participants, the researchers need to involve reliable theories in their research which can never be disproved.

4. Hypotheses

Hypothesis, unlike models, concepts and theories, is not self-confirming and their validity relies on their success or failure in real life (Silverman, 2013). The researcher can evaluate and modify the hypotheses following the finding of the research (Myers 2013)

5. Methodologies

Methodologies or research strategies consist of selection of approaches to data collection and analysis to plan and execute the research. Similar theories, methodology is self-confirming and its degree of value varies between different perspectives (Silverman, 2013). Bryman and Bell emphasise that a methodology defines a general orientation to the conduct of research (2015).

6. Research methods

Like methodology, *methods* are self-confirming and their value depends on their fit with theories, methodologies and hypotheses. They consist of particular research techniques that can vary from qualitative to quantitative techniques or include both of the techniques (Silverman, 2013). Bryman and Bell (2015) describe research method as a specific technique for collecting data.

The schematic relationship between these six research terms is illustrated in Figure 3-1. The arrow between *findings* and *hypotheses* indicates a feedback mechanism that presents the opportunity to modify hypotheses in the light of findings.

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Figure 3-1. The relationship between the six research terms (Silverman 2013, p. 114)

3.3. Theoretical assumptions made in the conduct of the research

In this research, the theoretical assumptions that are specified by the implications that are as follows:

- The researcher's mental model
- The research ideas in the field of CKC that contributed to the starting point of the research
- The concepts deriving from the research ideas
- The theories supporting these concepts and contributed to the definition of hypothesis

3.3.1. The research paradigms

Research paradigm consists of the factors influencing what should be studied, how research should be done and how results should be interpreted (Bryman and Bell, 2015). The primary focus of of this research is on collaborative knowledge creation within or across service organisations. The researcher values service organisations as social entities that are under the influence of individuals' perceptions and actions. Therefore, it was important to consider the influence of individuals' perception and ideas on the success or failure of collaborations. Gergen and Thatchenkery emphasise that the theoretical commitment of the researcher supports the research quality. Following this, the researcher considered the studies that address the social factors associated with effectiveness of collaborations (2004). Moreover, this research value the role of collaborative leader on assisting participation in collaborations with the aim of collaborative knowledge creation as significant on the effectiveness of the CKC process.

The role of perceptions and ideas of participants in CKC forms the assumption that knowledge characteristics and knowledge creation can only be measured through the interpretive understanding of participants' view on such concepts. Moreover, this approach supported the diverse participants in collaborations in terms of describing event and problem-centred knowledge from their own perception. Weber (1947) explains that interpretive understandnig of social actions – action includes the subjective meaning of human behaviour – enables causal explanation of the action's course and effects. Bryman and Bell (2015, pp 28-29) emphasise that Weber's description accepts *explanation* and *understanding*, however

the role of *causal explanation* should refer to the *interpretive understanding of social action* rather than to external forces that have no meaning for those involved in social action.

3.3.2. Research ideas

The research ideas that emerged during the early stages of this research are as follows:

- Lessons learnt from existing approaches to knowledge creation and collaboration techniques can assist the process of collaborative knowledge creation
- The commonalities between the process of knowledge creation and the concept of learning have important value for this research
- Individuals with problem-centred knowledge could contribute to knowledge creation and problem-solving
- Collaborative leader could assist collaboration across stakeholder boundaries
- Spanning knowledge boundaries (syntactic, semantic and pragmatic boundaries) could contribute to the effectiveness of collaborative knowledge creation

3.3.3. Research concepts

Knowledge characteristics, collaborative knowledge creation, group dynamics and collaborative leadership are the research concepts that assisted the researcher to interpret the set of ideas outlined in section 3.3.2. The review of the literature reported in chapter two presents these and other concepts as part of the main research problem. Consequently, they were combined to form the secondary research questions presented in chapter one.

3.3.4. Theories

Understanding the benefits and limitations of existing approaches to collaboration and knowledge creation supported combining relevant literature with empirical work on the research topic of CKC to maintain the focus of this research. Bryman and Bell (2015) explains that to address the negative influence of the limitations of theories on validation of research findings, the researcher could employ the literature in place of theories to inform the definition of research questions. They (p. 22) state that theory is latent or implicit in the literature and, therefore, researchers can employ literature as an alternative method to theory.

3.3.5. Hypothesis

The ideas outlined above were arranged around the primary research question and informed by the relevant literature, hypothesis was defined as follows:

> *Addressing the challenges associated with engaging diverse stakeholder groups in existing approaches to knowledge creation has the potential to increase the efficiency and effectiveness collaborative knowledge creation.*

3.4. Methodological approach to data collection and analysis

In addition to practical issues that are discussed in this thesis, theoretical assumptions of the researcher contribute to the process of data collection and analysis carried out to test the hypothesis defined in section 3.3.5. Spencer *et al.* (2014) remark that to assist others to assess the research method employed by researchers and to consider any limitations the method holds, researchers need to provide a thorough description of the design and conduct of the research. To address this, this part of the thesis includes describes research methodology, research design and research methods employed by this research and the issues related to them.

3.4.1. Research methodology

The definition of research problem in this research, in addition to the ontological and epistemological dimensions of its study, suggests that the conduct of this research follows a qualitative research methodology. The main reasons supporting the relationship between qualitative research methodology and the process of data collection and analysis in this research, as outlined by Bryman and Bell (2015), are as follows:

- Principal orientation to the role of theory in relation to research is inductive and includes generation of theory. In contrast with quantitative research, the qualitative research is not concerned with generation of theory rather than testing of an existing theory. In this research. The focus is on investigating the existing theories available in the literature that are relevant to CKC. Moreover, this research focuses on research findings that can contribute to the development of new theories that could create the opportunities of business improvement through CKC processes.

- The epistemological orientation is interpretivism. The reasons behind individuals' ways of interpreting concepts related to CKC – such as value, trustworthiness and applicability of knowledge – has significant value in this research
- The ontological orientation is constructionism. In this research individuals' perception and ideas creates social phenomena and their meanings that are being accomplished by social actors, continually. Therefore, its discussion is often in relation to the nature of knowledge that can be produced through social interaction or produced in a constant state of revision

3.4.2. Research design

In this research, development and implementation of a new approach to CKC between different stakeholder groups of service organisations contributes to refining and validating the findings of this research. Yin emphasises that the key element of research design is its quality (2014). Planning to achieve this is the key motive to employ *case study* as the research design which would assist the researcher to clarify the process of developing new approach to collaborative knowledge creation and its implementation.

Yin (2014) clarifies that case study research is a formal method and it is not acceptable to consider it as a tool for exploring other research methods (i.e. ethnography, participant-observation). Miles *et al.* (2014) remark that case study is not a methodological approach; it is a theoretical perspective of research methodology. Yin explains, other methodological characteristics can be considered as the '*features of case study'* (p. 17). He suggests that one of the key requirements of case study research is comprehensive planning. Yin's systematic approach to case study design adds to the quality of the research through designing case study protocol and suggests that although conceptual structure is a necessity in research process, the research phenomena evolves along the research process and a procedure limits this gradual development during the research.

Eisenhardt and Graebner (2007) remark that case study approach supports the assessment of theory building and for that reason; it is a valid form of research methodology. Yin (2014) explains that the term 'case study' is used both in teaching and research area and it is important to clarify the meaning of this term. In this research the term 'case study' is used from the research perspective Yin (2014) and Miles *et al.* (2014) emphasise that what to study (e.g. what event or condition) is a very important criterion. This explains that the case

should assist the research rather than creating additional phenomenon requiring additional research.

The researcher has chosen the *qualitative case study* as the research design because of three key reasons that are as follows:

- The *explanatory* nature and form of the primary research question:

  How can limitations of existing approaches to stakeholder engagement in collaborative knowledge creation within service industries be addressed?

  Addressing this research question does not require dealing with mere frequencies or incidence of specific events. It does involve a study of the links between CKC participants and their perception of issues such as engaging in and contributing to the process of CKC.

- To gain a clear understanding of the factors influencing the process of CKC (e.g. individuals' interaction, communication and collaboration), primary data are required these factors take place within a real-life context. Myers (2013) notes that *primary data* add richness and credibility to qualitative research. Moreover, Avison *et al.* (1999, p.94) argue that to make academic research relevant, researchers should try out their theories with practitioners in real situations and real organisations. Therefore, the researcher needed to employ investigative procedures, interviews with individuals who have problem-centred knowledge, discuss with CKC participants and observe the factors influencing the development and implementation of CKC processes. Yin (2014) emphasises that observation also allows the researcher to evaluate environmental and social structures in practice.
- Organisations do not provide a collaboration environment where the research could focus on one or two variables related to the CKC processes and control all the remaining variables beyond the scope of interest. Knowledge has a human dimension and its related processes are influenced by many behavioural variables such as motivation, politics, etc. which are beyond the control and even access of the researcher.

In addition to the issues discussed above, Yin explains that there are other issues related to case study approach such as issues related to generalisation, large amount of required time and the volume of data produced through case study approach (2014). In this research, both

the theoretical foundations imposed by the research context and the practicalities of its implementation imposed significant challenges that are as follows:

- Determining how many cases would provide the amount and quality of data that would be sufficient to validate the research findings. Yin (2014) emphasises that multiple case study research helps the researchers to gather compelling evidence and develop research that is more vigorous and reliable. Yin's multiple case study design that in relation to research question consist of set of two or more cases with exemplary outcomes was used in this research to support the development and application of the new approach to CKC.
- Finding organisations that were aware of their need for implementation of CKC processes and were able to engage in collaboration with the researcher towards these aims. In order to gain interest of organisations, the researcher prepared what was considered by herself and her academic supervisor as an 'interesting business case'. This was used to approach individual managers carefully selected from knowledge intensive organisations.
- Engaging in successful collaboration with those organisations. Given the cost and risks associated to a joint venture between an organisation and the researcher in an attempt to study the CKC problem, the researcher concentrated on achieving a successful outcome for both parties involved.

The description of the challenges associated with the research design in this research suggest that the data collection would be an iterative process that involves the researcher and practitioners acting together on a particular cycle of activities including the identification of the factors influencing a problem and participating in problem-solving. These activities are described in three categories that are: 1) problem diagnosis, 2) action intervention, and 3) reflective learning in the definition of *action research* by Avison *et al.* (1999). They (p. 94) state that *action research combines theory and practice (and researchers and practitioners) through change and reflection in an immediate problematic situation within a mutually acceptable ethical framework.*

Every effort was made to ensure that neither the challenges associated with qualitative case study research nor the practical issues related to the implementation of the research affected the rigour and relevance of its findings. In doing this, emphasis was put on the validity of theoretical and methodological decisions made during the design of the research.

The key steps of the research and the relationship between them is shown in Figure 3-2.

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Figure 3-2. An outline of the main steps of the research – adapted from (Bryman and Bell, 2015)

3.4.3. Research methods

One of the benefits of case study research is that it offers access to a wide range of sources of evidence that include documents and artefacts, interviewing participants and observing the development and implementation of CKC processes. Therefore, for data collection and analysis strategies, authors suggest using multiple sources of evidence (Yin, 2014), triangulating these data and using theoretical propositions from the research literature to guide the research (Myers, 2013). This has been the guide for the researcher's approach to data collection. Different methods were used to collect data, a process that was informed by the research questions and the relevant background literature on CKC.

Yin (2012, 2014) clarifies that unlike questionnaires for carrying out a survey, case study research is not limited to only one source of data and having multiple sources of data is one of the advantages of case study research. He explains that there are six common sources of evidence and depending on what source of evidence is available and relevant for studying the case, the researcher can use any combination as well as related sources. These six common

sources of evidence in doing case studies which informed the data collection in this research are as follows:

1) **Direct observation**
    i) Direct observation in a field setting – the focus of this method can be on real-world events, human actions or physical environment.

Jones and Somekh (2011) emphasise that what is observed is ontologically determined, that is it depends to a very great extent on how the observer conceptualises the world and his or her place within it. They explain that direct observation can be conducted through structured observation or unstructured observation.

- Structured observation

One approach is to structure the observation around a schedule prepared in advance. Schedules predetermine the categories of behaviour/talk that will be observed, and are inevitably influenced by the researcher's expectations, so it is usually best to develop a schedule especially for a particular research study.

- Unstructured observation

Another approach is to sit at the side or back of the room and make detailed notes. In this holistic approach, the researcher is guided by prior knowledge and experience and 'sees' through the unique lens of her own socio-culturally and professional background. Broad decisions are usually made in advance about the kind of things to be recorded, either on the basis of analysis of other data already collected (e.g. interviews) or derived from the focus of the research. It is best to record key utterances verbatim, as this reduces the extent to which intended meanings are obscured, and is usually quicker.

    ii) Using a formal observational instrument – the focus of this method is on defining the nature and frequency of interactions between individuals and it can be recorded with an audio-visual device or it can be observed directly.

2) **Open-ended interviews** (discussion and focus groups are variants of interviews, e.g. open-ended conversations with key participants)

Open-ended interviews (also called 'non-structured interviews provide the researcher richer and more extensive data. This method's flexible format that assists the researcher to learn how case study participants construct reality and think about situations which provides

important insights into the case. This method is less structured than open-ended portions of surveys and can be assumed a lengthy conversational mode not usually found in surveys. Open-ended interviews can occur over the course of an entire day, with a researcher and one or more participants.

Meetings and discussions during conducting this research provided the researcher data about the individual and stakeholder groups perception of knowledge transfer and creation in addition to the challenges associated with the knowledge transfer process across knowledge and stakeholder boundaries.

3) **Archival records** (note-taking)

In addition to direct observations and open-ended interviews, another source of evidence is note-taking which allows the researcher to store data and information. The researcher took notes during discussions and observation process of CKC. These notes are a combination of jotted notes presenting a record of informal observations and full field notes followed by initial ideas prior to conversations or events.

4) **Documentary evidence**

Both of the firms involved in the two case studies provided the researcher with secondary data such as administrative documents and prior conducted research. According to Yin (2014) theses data might contain an element of bias and for that reason, this research tread those as other unpublished secondary data.

5) **Participant-observation** (e.g. filling a real-life role in the scene being studies and being identified as researcher at the same time)

Jones and Somekh (2011) clarify that participant-observation gain unique insight into the behaviour and activities of those they observe because they participate in their activities and, to some extent are absorbed into the culture of the group. Disadvantages include that they may distracted from their research purpose by tasks given to them by the group, and note-taking becomes much more difficult and may have to be done after the event, ideally the same evening. It is also necessary to guard against becoming too immersed in the group's culture and losing sight of alternative perspectives.

Following the relevance and importance of discussion and observation in addressing the research questions, the researcher used these two methods of data collection almost

constantly during this research. Observation facilitates in-depth understanding of knowledge transfer between different knowledge and stakeholder boundary types, for the researcher. Following Yin's (2014), observation also allowed the research to evaluate environmental and social structures in practice. During this part of the data collection, the researcher's role involved all the four field roles of Junker's (1960) classification of field roles (see Figure 3-3).

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Figure 3-3. Field roles – represented in figure form by Gill and Johnson (2010, p. 167)

Jones and Somekh (2011) emphasise that observes always have some kind of impact on those they are observing, who, at worst, may become tense and have a strong sense of performing, even of being inspected. Negative effects are reduced if the purpose of the observation, how the data will be used, and who will be given access to them, are made clear in advance. It helps if the clothing worn by the observer merges into the context and signals equality of status with those who are being observed.

6) Physical artefacts (repository of information)

A final source of evidence is a physical artefact. Technological device or other physical evidence may be observed or collected as part of a case study that has been used extensively in anthropological research. This type of evidence has less potential relevance in the most typical kind of case study. However, when relevant, it can be an important component in the overall case.

The summary of comparative strengths and weaknesses of these six sources of evidence is shown in Table 3-1.

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Table 3-1. Six sources of evidence: strengths and weaknesses (Yin, 2014; P 106)

Once the set of relevant data on each individual case study had been collected using different methods, the use of triangulation enabled the author to contrast all data collected on that particular case and create a short report that described the case from a wider perspective.

3.5. Ethical issues

Miles *et al.*, 2014 explain that codes of ethics provide rules for securing permission, maintaining confidentiality and other legal terms that supports research participant' rights. They remark that field research and its accompanying dilemmas are often quite unpredictable and site specific which makes specifying ethical issues in advance almost impossible, however, some planning are necessary for application and review.

Some of the codes are very irrelevant to this research such as codes of ethics for working with minors or other vulnerable population. The fully or partially relevant ethical matters and issues for reflection are as follow:

3.5.1. Informed consent

Informed consent has an important part in researches that involve children, patients or other vulnerable population and it includes informing them about the study's goals in addition to assuring them of their rights throughout the project (Miles *et al.*, 2014). These categories of population are not relevant to this research; however, informed consent is partially relevant in terms of developing trust between the researcher and participants who contribute their time and insight to this research.

3.5.2. Harm and risk

There are many varieties of harm to participants from blows to self-esteem or *looking bad* to others, to threats to one's interest, position or advancement in organisations and so on (Miles *et al.*, 2014). In the context of this research, participants might feel insecure about the value of their knowledge, they might be afraid of negative consequences (e.g. their insight and ideas might be criticised or ignored), moreover they might be worried about losing ownership of their knowledge or losing position. All these can have negative influence on the participant and the effectiveness of CKC. Therefore, the researcher made every effort to ensure that these issues are addressed throughout the research.

3.5.3. Honesty and trust

For researchers, in addition to being honest in the course of their research, it is important to maintain reasonable trust among the participants of collaborations (Bstieler *et al.*, 2015; Denscombe, 2007). This supports efficient and free-flowing knowledge transfer and contributing to knowledge creation through discussions. He emphasises that facilitating this trust is the role of the collaboration leader who can create an environment that motivates participants' engagement in contributing their knowledge. This research considered the significance of this trust among the participants on the success of collaborations. To build this sense of trust, this research clarifies the purpose of the collaboration for the participants and its benefits for the domain that includes each and all of the stakeholder groups.

3.5.4. Right to privacy, confidentiality and anonymity

Miles *et al.* (2014) affirm that in research practice, the terms privacy, confidentiality and anonymity are often confused or used interchangeably, Sieber (1992, pp 44-45) describes the distinctions among these terms in research practice:

- Privacy. Privacy refers to individuals and their interest in controlling over other's access to themselves. Miles *et al.* (2014) explain that this involves preservation of boundaries against giving protected information or receiving unwanted information
- Confidentiality. Confidentiality is an extension of the concept of privacy and it refers to a form of informed consent agreement between researcher(s) and an individual or an organisation that include the ways of using data they provide to the researcher. Denscombe (2007) explains that ensuring confidentiality supports the development of trust among the participants. Participants who are ensured that their knowledge and experience will be treated as confidential by the other participants in the collaboration contribute their true knowledge and experiences. In this research, potentially sensitive data and information has been omitted or altered in order to maintain the confidentiality of the individuals, organisations their businesses.
- Anonymity. Anonymity means that the researchers never specify the source of data that might clarify the identities of individuals or organisations. In this research, the names of individuals and organisations involved in the conduct of this research are kept anonymous.

3.6. Summary

Once the research questions had been defined and the theoretical assumptions and issues affecting the data collection and analysis had been understood, it was necessary to have a plan for the investigation. Such a plan constitutes a research design and provides a framework for the collection and analysis of data. Kerlinger (1986, p.279) describes a research design as

> *"A plan, structure and strategy of investigation so conceived as to obtain answers to research questions of problems. The plan is the complete scheme or program of the research. It includes an outline of what the investigator will do from writing the hypothesis and their operational implications to the final analysis of data".*

The research design outlined during early stages of the research was limited by the practical issues related to its implementation, e.g. establishing joint ventures with organisations that were still to be found, as described in this chapter

The collection of data through a multiple case study will be detailed further as part of chapter Five.

This research follows the general view of the research design as much as possible, and ensures that the practical issues related to its implementation did not affect the rigour and relevance of its findings. Therefore, emphasis is put on following the theoretical and methodological decisions made during the design of the research.

CHAPTER FOUR

4. A NEW APPROACH TO COLLABORATIVE KNOWLEDGE CREATION IN SERVICE INDUSTRIES

This chapter presents a new approach to collaborative knowledge creation in service organisations that is based on assisting problem-centred knowledge transfer across diverse stakeholder groups within service industry to maintain effective collaborative knowledge creation. This approach has been developed to address some of the key limitations of existing approaches to collaborative knowledge creation as identified in the relevant literature. Moreover, this chapter includes a summary of empirical origins and theoretical foundations that informed the fundamentals of the new approach. In addition, it describes a method that can assist service organisations to implement the proposed approach followed by details of a sample application of the new approach in real service organisation.

4.1. Introduction

4.1.1. The empirical origin of the new approach to CKC

The collaboration between Coventry University and CMSorg, as introduced in chapter one, forms the beginning of the development of the new approach to collaborative knowledge creation.

In this field research, formulating the information need came first and it was followed by identification of possible sources containing the required information and then the process of extracting and absorbing the information and knowledge from these resources. Subsequently, data collected showed that the percentage of customers – one of the major stakeholder groups of service organisations (Coviello and Joseph, 2012) – being not happy with the services they

receive from the call centre departments was as high as complaint about other services (e.g. operation).

It became clear that constructive improvement in interactions between Customer Service (CS) staff and CMSorg customers noticeably increases the chances of enhancing customer satisfaction and organisation's reliability. CS staffs are customers' point of contact with CMSorg and one of their primary sources of information about all issues related to their service. To customers, CS staffs not only represent the company; CS staffs are the company. Moreover, this increased the awareness, at management level, of the need to share the problem-centred knowledge of CS staff on a regular basis.

Considering the knowledge-intensive call centre being the communication channel between the CMSorg and its customers, this study provided the opportunity of illustrating the potential need for knowledge management practices both within the customer care department, including the call centre, and across relevant department within this service organisation.

In addition to analysing customers' description of their dissatisfaction with CMSorg, the researcher conducted a series of collaborative meetings and she participated, as observer, in call centre training sessions to identify the factors influencing customer dissatisfaction with the call centre departments. This collaboration with the researcher and the new approach to collaborative knowledge creation was perceived by the CMSorg as successful approach to problem-solving.

A review of the literature was then conducted in an attempt to identify other work that was relevant for the formalisation of the strategy adopted. The literature review, included in chapter two, explored the potential advantages of combining collaborative leadership and assisting group meetings and interviews for the purpose of overcoming the known limitations of current approaches to CKC in service organisations.

4.1.2. The extent of the new approach to CKC

To better understand the need for facilitating collaborative knowledge creation across diverse stakeholders within one domain in developing collective solutions – from which all the stakeholders would benefit – it is necessary to have a clear recognition of boundaries that keep apart stakeholders which performance have direct or indirect influence on the performance of the domain as a whole.

This collaboration approach helps concerned diverse stakeholders in a domain to develop models describing the factors initiating any given problem affecting that domain. This approach is about empowering stakeholders to make a difference in the service performance through providing them with ways to collaboratively find the most effective solution for complex problems. It Creates powerful group dynamics and assists working on complex problems with people with different identities.

Collaborative knowledge creation involves facilitated open environment – where there is no separation between research and practice – knowledge transfer that is open to stakeholders to meet and communicate current problems. Throughout the collaborative knowledge creation action learning and action research merge and stakeholders involved benefit from this activity and the outcomes of it. Participants in collaborations engage in developing emerging solutions driven by real-life problems while knowledge transfer and creation occur in parallel.

Collaborations need to have a design that fits the context, purpose, stakeholders and defined duration. It does not include predetermined outcome but creates an environment within which diverse stakeholders work together as a team and problem resolution and possible solutions emerge from their collaboration. Therefore, skilful facilitation of CKC is of critical importance for creating and holding such collaborations.

4.2. Ep-s: A method for implementation of the new approach to CKC

4.2.1. Characteristics of Ep-s

Successful facilitation of collaborations develops solutions addressing the problems at the scale it is designed for. Regardless of availability of resources, the success of collaborations depends on effective use of resources including time and knowledge. Burck (2014) remarks that depending on the complexity of the problem and process of knowledge transfer and creation, the duration of collaboration can last from hours to days. In order to assist organisations to understand the process of applying the new approach to CKC in practice, this research has designed a method that defines a set up steps that organisations can run. These steps are as follows:

1. Creating credible problem resolution

The field research at CMSorg suggested the process of creating credible problem resolution helps the individuals to structure their understanding the key factors influencing the problem. In other words, collecting different perceptions of the problem facilitates understanding the interconnectedness of different factors that develop the problem affecting the domain. In this step holistic understanding of the factors influencing the creation of the problem facilitates developing holistic resolution of the problem. Schwarz suggests that facilitating learning more about the participants' knowledge around the problem can support minimising defensive behaviour among the participants who withhold judgment and investigate others' reasoning (2002). This understanding prepares the analysis leading to identifying required problem-centred knowledge for knowledge creation and problem-solving.

2. Communicating perceptions of the problem across knowledge boundaries

Spanning knowledge boundaries – syntactic, semantic and pragmatic boundaries – as discussed in section 2.4.4, has a fundamental influence on effective communication of tacit knowledge in the process of knowledge creation. Polanyi (1962) emphasises that tacit knowledge consist of series of conceptual images embedded in individual's mind and the key to effective knowledge creation is to enable participants to illustrate visual representations of their tacit knowledge and make it explicit in collaborative processes. In addition to converting tacit knowledge into explicit knowledge, Nonaka and Takeuchi (1995) affirm that *express the inexpressible* it is critical step in the implementation of CKC. They explain that this step involves using figurative language to presents and share perspectives. They emphasise that figurative language or models of domain knowledge can take the form of analogy or metaphor, anecdote or diagram to facilitate creating common understanding between individuals with different identities.

3. Identifying and engaging individuals with problem-centred knowledge

The field research suggests that involving individuals from different stakeholder groups who have experienced specific problem or knowing the factors influencing that problem through experience would contribute to the effectiveness of the knowledge creation and problem-solving. Morris (2013) remarks that participation of different and diverse stakeholder groups in problem solving approaches can have both positive and negative effects on the process and outcomes of the approaches. He emphasises that clarifying the factors associated with stakeholder engagement that affects the success or failure of collaborations should be the priority in developing and implementing collaboration with stakeholders.

Consequently, Ep-s considers addressing these factors through some CKC techniques that are as follows:

- Managing the impact of conflicting priorities

  Breese (2012) affirms that conflicting priorities is one of the problems related to gathering stakeholder groups. Bosch-Rekveldt *et al.* (2011) explain that different stakeholder groups have varied expectations and desires that add to the complexity of engaging stakeholders in collaboration. Morris (2013) emphasises that clarifying the purpose and benefits of the collaboration for stakeholder groups expands their willingness to engage in collaboration.

- Moderating the impact of knowledge diffusion across boundaries

  Stakeholder groups have the sense of protecting the deployment of the group knowledge across boundaries. Ernst and Chrobot-Mason (2010) emphasise that to achieve effective collaboration across boundaries, it is important to supports the stakeholder groups' engagement in collaborative problem solving in line with maintaining intergroup satisfaction with the knowledge transfer practice.

- Creating transparent environment

  Transparent problem solving environment facilitates learning about different effects of the problem on each stakeholder groups and their concern through sharing experiences. Ernst and Chrobot-Mason (2010) asserts that transparent collaboration environment within which stakeholders learn about other groups' values, priorities, expertise and needs improves creating collaborative solution.

In this research, this method has been called Ep-s to stresses the strong relationship between the method and *E*ffective *p*roblem-*s*olving which highlights the significant impact of each of these steps on the success of implementing CKC.

The key roles in the implementation process of Ep-s are as follows:

1. The CKC leader

Ansell and Gash affirm that CKC leadership has embedded facilitative meaning and is essential in the process of addressing challenges associated with collaborative knowledge creation (2012). Diverse group identities and perception of the problem challenges the

effectiveness of collaborative approaches to problem solving. Facilitative leader helps the groups in creating common direction and expectations and supports developing shared overall interest but without neglecting that the diverse experiences and perspective are required to enhance the effectiveness of collective problem solving. Therefore, differentiating and coordinating has to occur simultaneously.

Schwarz (2002) explains that skilled leader approach is systemic approach to group facilitation; it significantly contributes to the effectiveness of group collaboration; it significantly contributes to the effectiveness of group collaboration. He emphasises that in this approach the skilled CKC leader is skilled in process, expert in content and involved in decision-making and these characteristics constitute CKC leader.

Diverse group identities and perception of the problem challenges the effectiveness of collaborative approaches to problem solving. CKC leader helps the groups in creating common direction and expectations and supports developing shared overall interest but without neglecting that the diverse experiences and perspective are required to enhance the effectiveness of collective problem solving. Therefore, differentiating and coordinating has to occur simultaneously.

Leading stakeholder collaboration is a reliable approach to improving the effectiveness of the collaboration; however, it has its limits and challenges associated to these limitations. Schwarz (2002) recommends that understanding the nature of these limitations supports the CKC leader in altering process and structure of the collaboration, to a feasible extent, towards minimising the limitations affecting the effectiveness of collaboration.

Field research at CMSorg and review of the literature, in particular, as discussed in section 2.4.6, guided this research in describing key roles of CKC leader which have direct influence on the effectiveness of collaborations in three categories that are as follows:

1) **Evaluating** problem-centred knowledge and selecting stakeholders

Deciding problem-centred or problem-related knowledge empowers the effectiveness of CKC. Locating the required knowledge and accessing stakeholders who have problem-centred knowledge form the Evaluating role of the CKC leader. Involving the right stakeholders to assist identifying the knowledge resources is critical in this stage and the absence of links between different stakeholders adds to the complexity of this initial role.

2) **Enabling** knowledge transfer across stakeholder groups

Facilitating the knowledge transfer environment opens the lines of communication between stakeholders. Schwarz (2002) remarks that one of the core assumptions for effective knowledge transfer is that each participant has some relevant knowledge and, therefore, some experience required to understand and address the problem. He explains that assuming that each participant has relevant knowledge that would affect the understanding of the problem domain inspires knowledge transfer.

Schwarz (2014) remarks that facilitating mutual learning helps creating collective mind-set that elaborates the knowledge transfer between the stakeholders. He clarifies that collective mind-set enables the stakeholders with different perspectives on the specific problem to share their problem-centred knowledge and explain the factors that influenced their experiences.

CKC leader enables stakeholders to share all their relevant knowledge about the problem in hand by sharing specific experiences that involves their stakeholder group needs and interests and, in addition, explaining the reasons that their experience is relevant to the area of discussion. This approach creates learning environment for the stakeholders that supports them in creating collective understanding of factors influencing the problem in their domain.

3) **Engaging** stakeholders in knowledge creation

Katzenbach and Smith (2001) describe that preparatory activity helps speeding the formation of the group and facilitation helps the engaged group in problem solving and knowledge creation to function more efficiently. Peschl and Fundneider (2014) emphasise that knowledge creation is a result of interaction between different groups within highly complex network. Therefore, facilitated knowledge creation environment is required to support the knowledge creation process through integrating several dimensions of the environment including physical, social, cognitive, epistemological and technological.

This research proposes the *triple E model* that suggests these three main roles are interconnected and are not a series of independent roles and as illustrated in Figure 4-1 they are cyclic roles – the CKC leader can revisit the past evaluating, examine the inconsistencies or conflicts in the past enabling and engaging, and at the end, transfer the knowledge created across boundaries in the implementation of Ep-s.

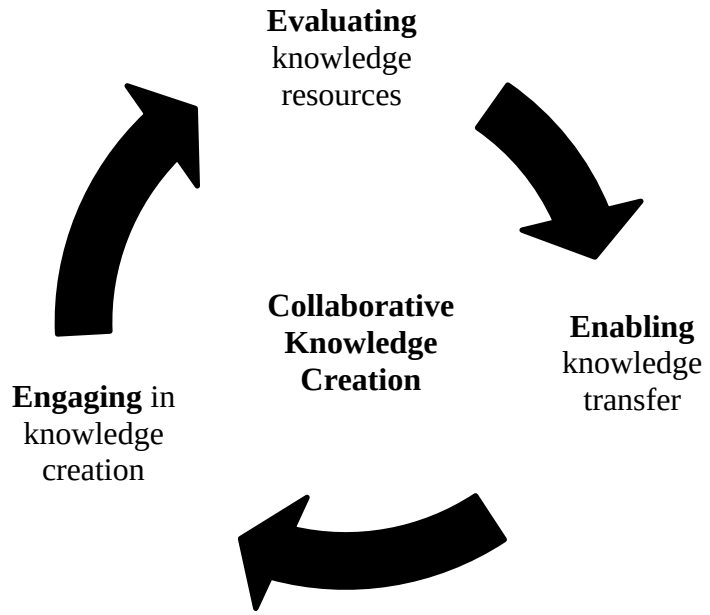


Figure 4-1. The cycle of CKC leader roles in the implementation of Ep-s: Triple E model

2. Individual participants

This research focused on involving individuals with problem-centred knowledge in the process of CKC. This method does not exclude individuals with relevant expertise. In contrast, it aims at gaining insight from individuals such as customers in addition to gaining insight from experts. During the field research, analysing customers' complaints helped the researcher to identify the causes of their dissatisfaction with CMSorg. Consequently, this research uses the term problem-centred knowledge to omit the skills and expertise focus on their experience which could contribute to knowledge creation and problem-solving. However, this research specifies where a particular skill or expertise was required and the research engaged experts in the process of CKC.

Ep-s has been used throughout the implementation and validation stages of this research. However, it is important to mention that this method does not represent the only mechanism by which the new approach to CKC proposed by this research can be implemented. The flexibility of this new approach enables the CKC leaders to adapt its implementation to the context and the circumstances in which it is to be applied.

4.2.2. The key steps of the Ep-s method

Conducting a CKC project based on collaborative problem-solving as defined by Ep-s comprises two key phases that can be divided into four key stages. The outline of these is as follows:

1. Designing the CKC project

It is possible to run single one-off or series of collaborative sessions over a period depending on the problem it is planned to address. Each collaboration session might require different skilful and selective leadership. The time required for designing the collaboration sessions depends on key factors including but not limited to the time required for identifying, selecting and inviting stakeholders who have problem-related knowledge in the concerned domain. Designing the collaboration sessions begins with exploring the purpose and objectives of the collaboration and they might be refined throughout the design process prior to the collaboration. The design process of collaboration sessions is iterative process of consulting collaboration experts and many aspects of design process develop gradually during this phase. Consequently, engagement of different stakeholders, additional facts and inputs will be required.

1.1. Project initiation. The design of the collaborative sessions needs to have its clear and compelling purpose to assist the achievement of the collaborative session's purpose. Therefore, the organisation and CKC leader(s) agree on the feasibility of implementing the method, its expected outcomes and the mechanics of its application at this stage. Moreover, it is important to identify and involve the stakeholder groups who have major influence on the elaboration of the problem and different stakeholder groups who are affected by the current problem in the domain. Selecting individuals from these stakeholder groups to participate in the CKC is a key outcome of this stage.

1.2. Project preparation. After identifying and selecting the right stakeholders, the CKC leader(s) need to plan effective approach for inviting the stakeholder groups to engage in collaboration. It is important to ensure the groups that their knowledge and ideas will be valued and support the outcome of the collaboration and they will benefit from the outcome. Moreover, Designing and implementing the structural components of the collaboration involves planning and scheduling. In addition to

creating conceptual environment that coordinates participation, physical environment conductive to coordinating participation is essential.

2. Collaborative knowledge creation
   2.1. Knowledge creation. During these meetings, consulting the problem between the CKC participants and creating the common vision settles clarifying the current state of the problem and leads to deciding on required knowledge stocks. Creative brainstorming between the stakeholders is required to help the external stakeholders share emerging ideas and identify the knowledge available within each group of stakeholders that the collaboration can benefit from in terms of solving the problem.
   2.2. Review and reflect. The CKC leader(s) lead the participants to review and evaluate their findings. The feedback loop assists the participants to reflect the new insight and knowledge and refine, if required, the development of the components of final solution.

The relationship between these phases is shown in Figure 4-2.

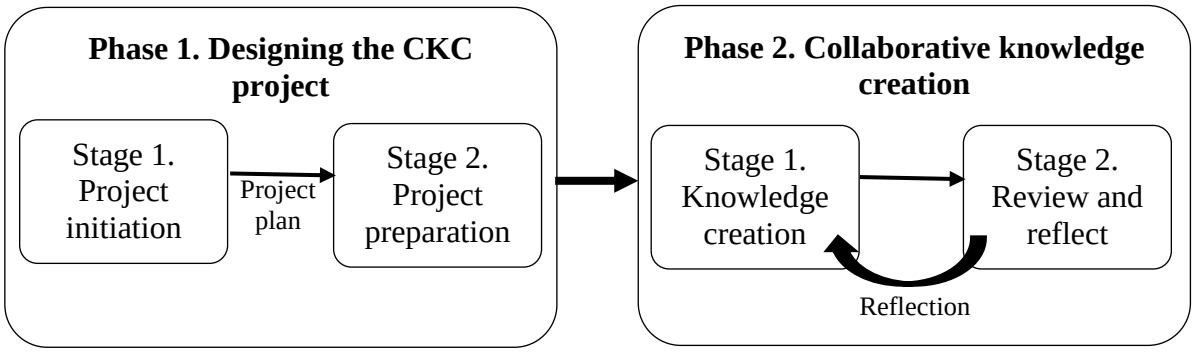


Figure 4-2. Key phases of the implementation of Ep-s

The evaluation method proposed by this research to identify the validity and applicability of new knowledge created during CKC process is shown in Figure 4-3.

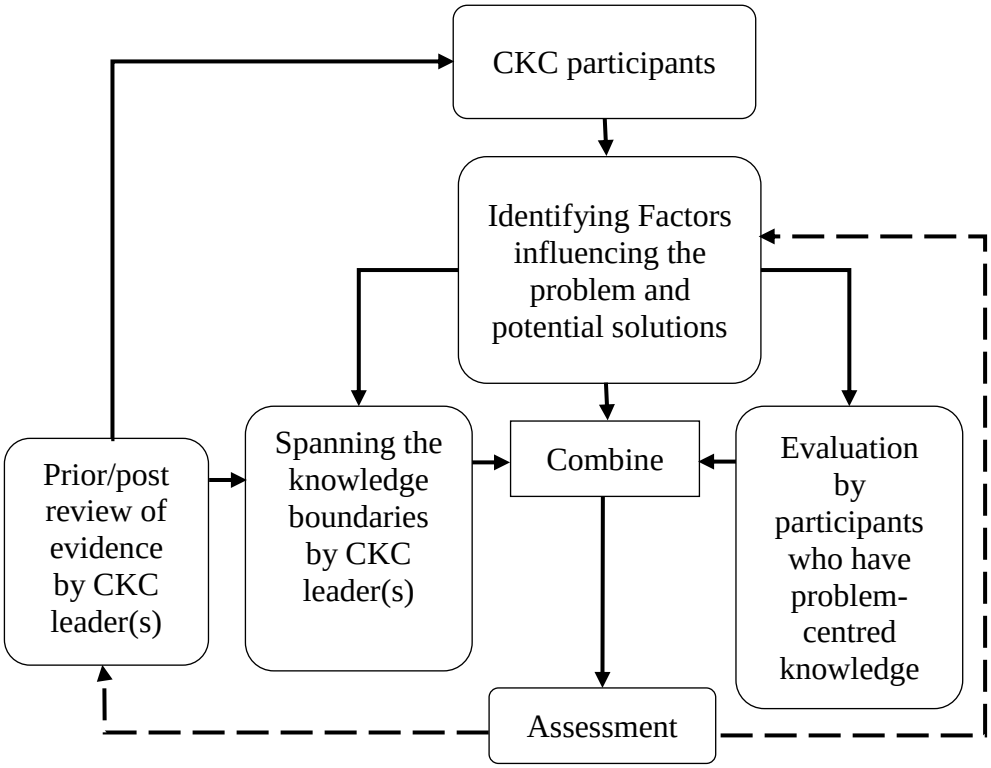


Figure 4-3. Evaluating the knowledge created during CKC process

The remainder of this chapter outlines the approach to implement each of the Ep-s phases. These definitions and descriptions are informed by the theoretical issues influencing the method and the experience gained by applying and refining in the field, which will be discussed in chapters five and six.

Phase 1. Designing the CKC project

Phase 1 – Stage 1. Project initiation

A CKC project can have some cost for service organisations. This might include intangible cost such as encouraging customers to participate in sharing their experience about a particular service with the services provider or freeing a number of key employees from their core work in order to participate in the CKC meetings. It also might include tangible cost such as appointing internal experts or external researcher(s). Organisations can minimise this form of cost and benefit from accessing the expertise and knowledge they need without having to hire full-time experts. For example, research students and staff in universities seek opportunities to apply or create theories and organisations need solutions for complex

problems that could not be addressed through organisations' resources. Consequently, collaboration between universities and organisations is one of the methods that strongly motivate both parties to engage in collaboration and contribute to business improvement of one another. This method, significantly, contributed to the development of the new approach to CKC in this research.

The starting point for a CKC project is the assumption that the organisation is aware of its benefits and determined to commit the required resources to its implementation. Therefore, to prepare for the implementation of Ep-s, the aims of the project initiation stage are as follows:

- The key purpose of collaboration between stakeholders is bringing them together to achieve solutions for problems in their domain. Therefore, it is important to develop a mutual understanding between the organisation and CKC leader(s) about the need for and expected outcomes of CKC process. The specification and availability of the knowledge required for Ep-s depends on the ability of organisation and CKC leaders in understanding the purpose of CKC.
- The collaboration designing team consist of representative of concerned organisations and CKC leader(s). Bringing together critical bodies of knowledge in the collaboration design phase, specifically in the initiation stage, have significant influence on the success of CKC process
- Selecting the right stakeholder groups for CKC. CKC meetings bring together diverse and segregated stakeholder groups that consist of stakeholders groups influencing the current problem in a domain and stakeholder groups affected by that problem.

In order to achieve such aims, organisation representative(s) and CKC leader(s) are expected to discuss and agree on the following issue:

1. Developing a clear purpose with CKC team and identify knowledge domain
2. Engaging the right people in the design phase
3. Selecting the right stakeholder groups for CKC

Part one. Developing a clear purpose with CKC team and identify knowledge domain

It took two discussion meetings between the CU research group and CMSorg representatives to agree on purpose of CKC and knowledge domain. In the first meeting, the participants were as follows:

- CU research group
    - The researcher – CKC leader
    - Knowledge elicitation and transfer (KET) expert
    - CU research group representative
- CMSorg representatives
    - CMSorg representative – CKC leader on the organisation side (Customer Insight and Assurance Team > Customer Relations > Business improvement analyst)
    - Customer service expert
    - Data analyst expert

The researcher used structured observation method for this meeting. Her field role was mainly observer as participant and she used the note-taking method to record the observation and key points discussed during the meeting to address the initial ideas prior to this meeting. She noted that the representatives' approach during explaining CMSorg' problem with regulatory bodies was defensive. During this meeting, there was reluctance to accepting CMSorg receives high level of customer dissatisfaction with the its service for the reason that the representatives needed to dismiss any negative opinion that would challenge the quality of services provided by CMSorg. The researchers needed to break down this usual pattern and comfort the representatives that investigating and accessing any source of data that represents the reasons of customers' dissatisfaction with CMSorg service will help finding causes of dissatisfaction with the firm that claims providing the best service to its customers and these data will remain confidential in any document produced for other parties.

In the second discussion meeting, the participants were as follows:

- CU research group
    - The researcher
    - Knowledge elicitation and transfer (KET) expert
- CMSorg representatives

- Business improvement analyst
- Customer service expert

The field role the researcher was complete participant. During this meeting the purpose of this collaboration was clearly identified and both of the research group from CU and representatives from CMSorg understood and accepted the purpose. The purpose was outlined to analyse a sample of the interaction between CS staff and CMSorg customers in order to identify any information and knowledge-related issues that can be addressed by CMSorg in its attempts to improve their customer service. This analysis of data already available at CMSorg looking for issues related to information, knowledge and their sharing with relevant departments was likely to lead to a set of recommendations for actions.

At this stage of Ep-s the researcher proposed set of steps for identifying customer dissatisfaction with the service provider. The steps and relationship between them are illustrated in Figure 4-4.

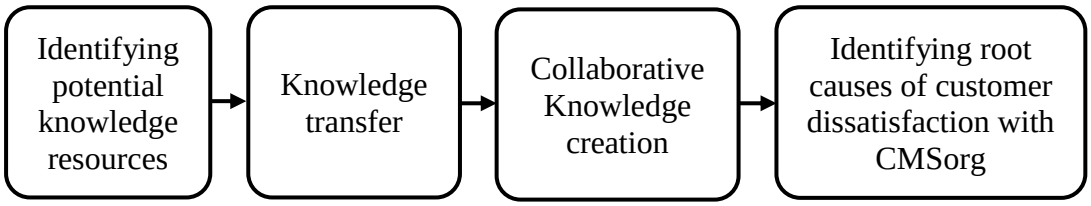


Figure 4-4. Key steps of identifying customer dissatisfaction proposed by this research

It was agreed that this collaboration would achieve three deliverables that are as follows:

1. Write a document to report the key issues found.
2. Present the findings to CMSorg representatives.
3. Contribute to the outline of a strategy for improvement in those information and knowledge-intensive areas that have an impact on customer satisfaction within CMSorg.

<u>Part two. Engaging the right people in identifying required knowledge resources</u>

The participants in this stage of CKC that creates CKC team are as follows:

– Research group from CU
  - The researcher
  - KET research expert

- Business Improvement Analyst from CMSorg
- Customer service expert from CMSorg

In order to understand any knowledge-related issues potentially affecting customer satisfaction the participants identified two areas of concern:

- The reasons of customers' complaints, and also
- The interaction between CS staff and CMSorg customers

It was agreed that to do this project, the researcher would use data already available on the CMSorg electronic data storage and study input from CMSorg customers and from CS staff in their interaction.

This was followed by outlining the data analysis that is as follows:

The data to be analysed have a qualitative nature and therefore the methodology that would lead the researcher throughout their analysis can be outlined as follows:

In the analysis of customer complaints, the researcher attempts were as follow:

1. Key information-intensive areas: Identify from the services provided by CMSorg key areas that are dependent on information and knowledge, e.g. billing, rates etc.
2. Root causes: Identify from the data available a set of customer complaints that causes may be related to one or more of the key information-intensive areas identified above.
3. Document review: Review documents related to the set of complaints in order to extract for each complaint those issues that can be related –directly or indirectly, to the request or supply of information resources (i.e. to the key information-intensive areas).
    - A set of complaints would be selected based on parameters to be agreed with the CMSorg supervisor (Business Improvement Analyst) and the academic supervisor (KET research expert).
    - Documents to be reviewed in relation to each complaint may include forms of communication between CMSorg and its customers, such as letters, emails, telephone calls etc.
4. Key issues (per individual complaint): Extract key issues emerging from each individual customer complaint selected.

5. Key issues (cross-complaints): Look for patterns or recurring issues, i.e. appearing in more than one complaint.

Phase 1 – Stage 2. Project preparation

Part one. Selecting individuals with problem-centred knowledge for CKC

The purpose of the collaboration helps identifying the potential stakeholder groups and selecting representatives from those groups who have problem-centred knowledge and can contribute to the process of CKC. Therefore, in running Ep-s there are no particular restrictions on the professional background of individual participants. They may have complementary or even contradictory views of the domain. Archer and Cameron (2012) emphasise that CKC leadership assist gaining value from these. Schwarz (2002) remarks that skilful leader(s) can turn these differences into learning objects that can clarify the problem domain. Therefore, such differences have the potential benefits for later stages of Ep-s.

In the CMSorg project, it was important to investigate information and knowledge issues from data available in order to select the right stakeholders for the collaboration.

The issues related to information and knowledge resources and their sharing that would be sought by analysing the interaction between CS staff and CMSorg customers includes, among many others, the following:

1. Resources which are available within the CMSorg but are not provided to the customer (despite having been requested on occasions) due to lack of knowledge by the CS staff or on the basis of existing CMSorg policies,
2. Resources that are provided to the customer (whether or not these have been requested) but are not necessarily correct, relevant or accurate, or are not based on CMSorg standards.

Nonaka *et al.* remark that experimental knowledge represents tacit knowledge that is shared among internal and external stakeholder groups including customers (2001). Therefore, two of the very important sources of experimental knowledge about customer dissatisfaction with the service provider are customer experience with the service provider and call centre experience of handling customer queries. Consequently, in order to understand these issues, the following data would be investigated:

1. Customer complaint data: The intention is to understand the main reasons leading to customers complains in order to analyse which of these maybe related to information and knowledge.

Customers create one of the major stakeholder groups of service providers. Bosch and Enríquez (2005) remark that the customer complaint involves the experience of the customer with the failure of product or service; this brings valuable knowledge for that firm and it is important to gain insight from the complaints and consider them as a learning opportunity.

2. CS interview: The intention here is to conduct interviews with CS experts and analyse the factors influencing the quality of the interaction between customers and CS staff.

The demarcation line or region between the service provider and its customers creates stakeholder boundary. Call centre employees operates between the firm and its environment that represents the role of stakeholder boundary spanner. The accuracy of the knowledge and information exchanged between them and the firm and its environment is the primary responsibility of call centre employees.

After identifying the above discourse, the stakeholders selected for this CKC were as follows:

- The researcher from CU
- KET research expert from CU
- CMSorg representative (Business Improvement Analyst) who had the role of business expert in this collaboration
- Customer service experts from Strategy, Customer Insight and Assurance Team
- Customer service experts from CMSorg different sections of call centre departments (Credit, operation and general enquiries)
- Customers – the end users of the service

<u>Part two. Inviting the selected individuals to engage in CKC</u>

- The researcher from CU

  This collaboration was part of the researcher's PhD and the researcher was willing to learn from practice during this field research and contribute to the success of the project

- The KET research expert from CU

  This collaboration was part of KET research expert's research work at CU.

- CMSorg representative

  CMSorg representative was highly encouraged to identify the factors influencing customer dissatisfaction with this service organisation and, therefore, he was willing to engage in CKC as part of his work in business improvement

- CMSorg customer service departments

  The CMSorg representative selected a group of expert from different CS departments who have knowledge related to customer complaints. All of these participants agreed on the benefits of CKC approach that can address customer dissatisfaction with the CMSorg services

- Customers – the domestic users of the service

  CMSorg informed the researchers about the survey data it collects from the customers and mentioned the type of information available in the database. CMSorg mainly explained that they are deploying this data collection only because the regulatory bodies require it. The telephone survey was not developed for improving the service performance but solely because the regulatory bodies need this survey to be done. CMSorg mentioned this survey as part of their activities addressing the requirements of the regulatory bodies and the researcher attempt in wanting to know more about what is included in that survey helped the group to learn that the data available can be used for some quantitative measurements and sentiment analysis of customer dissatisfaction with CMSorg. In the later stage of data analysis, the researcher's idea was that qualitative analysis of the content of feedback customers leave in the survey can help and lead to better understanding of their needs and expectations from the service.

Part three. Planning the conceptual and structural requirements

To conduct this field research, the researcher required a desk and computer at CMSorg. CMSorg arranged the desk in the same area as CMSorg representative worked but refused to provide the computer for the server security reasons.

The researcher required access to CMSorg database related to customer complaints and survey. CMSorg rejected access to database and CMSorg representative arranged the required data in Microsoft Office file that the researcher could have access to from her laptop.

Peschl and Fundneider (2014) explain that the structure, architecture and design, comprises all the elements in collaboration environment and its context. They emphasise that designing facilitative environment to support social interaction, knowledge transfer and knowledge creation is difficult. They remark that poor architecture supports ineffective collaboration rather than effective knowledge creation. However, the conceptual structure had a prior role in CKC project with CMSorg. During this field research, most of the meetings with the CMSorg representative and other experts from CS were one-to-one meetings and did not require any specific structural arrangement as they could take place at the researcher's desk or the expert's desk. The meetings that included more than two people or the ones which needed projectile and screen could be arranged on the same day of the meeting and did not require any particular preparation. However, conducting circle meeting was never neglected in any of these group meetings and it was maintained throughout the CKC meetings to facilitate participants' interaction and participation in knowledge creation. Pranis (2014) suggests that a group sitting in Circle meetings are considered as equals and this helps them to listen to one another better and better understand each other's concerns and frustrations during the meetings. She explains that circular talks can be used as facilitator connecting the participants. Baldwin and Linnea (2010) emphasise that choosing circle meeting has become an incidental part of many co-creative innovations and modern group meetings and can be considered as required basic setting of any meeting.

Phase 2. Collaborative knowledge creation

Phase 2 – Stage 1. Knowledge creation

Part one. Clarifying the purpose of CKC with participants

The collaboration might not have participated in collaborative KC sessions or might not have clear understanding of the purpose. It is the leader(s) responsibility to prepare an environment that enables participants to engage in sharing their experience without being concerned about their knowledge not being valued or misused. Neglecting the significance of this trust among the participants would result in omission of expected value of the collaborative CK. To build

this sense of trust, the leader(s) should clarify the purpose of the collaboration and its benefits for the domain that includes each and all of the stakeholder groups.

The purpose of collaboration was to improve the CMSorg and the researcher interpretation of the root causes of customer dissatisfaction. The purpose was reviewed at the start of all the collaboration meetings with CMSorg representative and CS experts. It was easy to accept the purpose of CKC for them. In particular, because they had some assumptions but the specific reasons of customer dissatisfaction were not really clear and they were eager to identify the causes of it. Moreover, customer feedback collected through telephone survey was used as knowledge source that can contribute to the CKC project. However, clarifying this purpose with CMSorg customers who participated in the telephone survey was not possible. Although regulatory bodies required this survey to identify the reason of customer complaint, the survey did not clearly identify its purpose to the customers. Moreover, it was not possible to inform the customers that they are participating in CKC. Therefore, significant amount of time was required to select the feedbacks that fit the purpose of CKC and address the impact of researcher bias and participant bias. Therefore, it is critical that the researcher be able to select valid feedbacks and analyse them not based on the personal sensitivity but the actual quality of the service provided and the validity of feedback. In order to do so, the researcher made every effort to address these issues through two linear actions that are as follows:

1. Selecting valid customer feedback

After customers' phone contact with CMSorg, they receive a telephone survey in a text format in which they can rate CMSorg (1-5: satisfied – dissatisfied), they can rate the agent they spoke to (1-5: satisfied – dissatisfied) and they have an option which allows them to write a feedback about the service at the end. The researcher did not rely on the ratings for examining customer dissatisfaction with the service for two reasons. First, according to the content of feedbacks, some of the respondents entered a wrong number by mistake; second, it did not specify which service from CMSorg or department has been rated. Therefore, for an accurate evaluation of the experience of customers with the service, only the feedbacks are the focus of this research. CMSorg did not consider this analytical approach to understanding customer dissatisfaction prior to this research.

The number of feedbacks collected in seven months was 39,732, among which more than half were not valid (only yes/no/na etc. was written or the feedbacks was stored more than once) which left the total number of valid and accurate feedbacks about 15,000.

To maintain a deeper understanding of customer needs and expectations, 9,000 of the valid feedbacks were randomly selected for this research. The intention was to understand the main reasons leading to customer dissatisfaction in order to analyse which of these maybe related to information and knowledge. As no prior research has explored the content of the feedbacks, a qualitative research was conducted to facilitate categorizing the feedbacks and empower qualitative analysis. Following replication strategy (Yin, 2014), looking at contrary data (both negative and positive evidences), quantitative data analysis (Miles *et al.*, 2014) and exploring embedded sub-cases within the case were explored in this part to add confidence to the findings.

2. Reviewing challenges associated with specific services provided by CMSorg

This was done through reviewing available evidence (e.g. stored data and documents, STW reports, STW website) and interview/discussion with customer service experts within CMSorg.

The evaluation method used to identify the customer feedback that fits the purpose of CKC is illustrated in Figure 4-5.

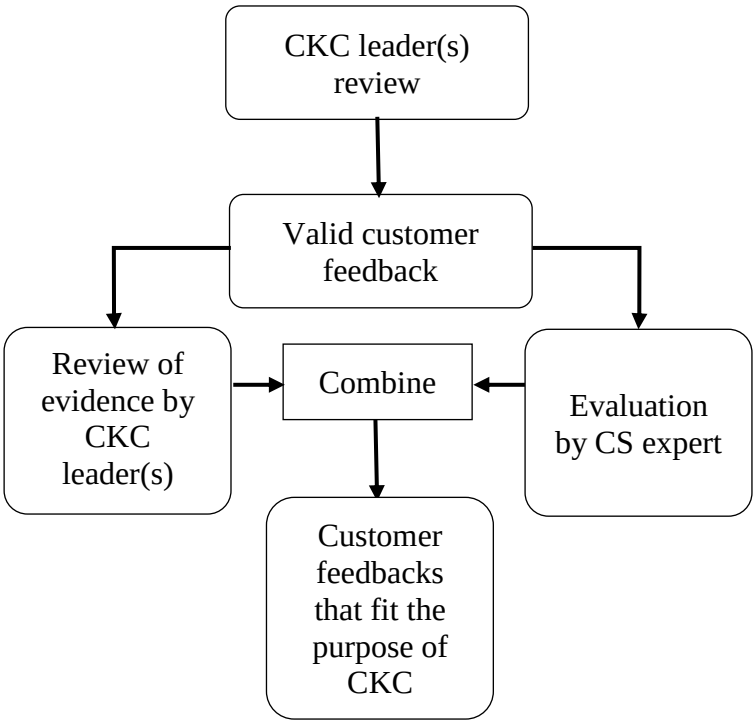


Figure 4-5. Identifying applicable customer feedback

Part two. Engaging participants in sharing their perceptions of the problem

This stage of Ep-s assists CKC leader(s) and participants in hearing each other while the participants are invited to freely discuss their perception of the problem including their concerns without being interrupted by other participants. The leader should prepare an environment in which each of the participants have the opportunity to express their problem-centred knowledge without being interrupted with other participants who might have different or complete opposite assumption of the problem. It is the leader's responsibility to ensure that each participant's perception of the problem and area of concern are valued. Moreover, collecting different perspectives helps the leader and other participants to better understand the areas of concern for different stakeholder groups.

The facilitator prepares the interface between the participants and ensures the transparency of the discussions around the factors affecting the problem. This approach assists adjusting conflicting assumptions among the participants and creating valuable insight into the problem that results in developing matured understanding of the challenge in the domain. Schwarz (2002) remarks that conflict is inevitable part of collaborative group; however, skilled leader can turn this conflict into effective group collaboration. He explains that skilful leader turns conflict into learning objects that can contribute to better understanding of the problem domain.

In order to understand internal external stakeholder groups' perception of the problem (customer dissatisfaction with CMSorg), the researched conducted a series of open-ended interviews with CS experts from three different departments. A summary of their perceptions is as follows:

- CS expert from the operation department

  She explained that, previously, one CS employee was in charge of customer complaint from its start to end. She believes that the previous method was more convenient for both the customers and CS employees because the employees understood the problem and followed the steps of addressing it. CMSorg employed new method in which after each customer contacts CMSorg, the CS employees only leave comments in the customer profile and do not have the responsibility of following the case. These complaints will be distributed between CS employees according to their availability, every morning, and the employees do not necessarily

follow particular complaint. She explained that now they have to try to understand the comments, which are not always clear and easy to understand. Moreover, they have to try to understand the customer's explanation of the problem every single time.

This specific perception of the problem did not add much value to understand the customer dissatisfaction with CMSorg but it did clarify the challenges associated with knowledge boundaries both between the CS employees and between CS employees and CMSorg customers.

- CS expert from credit department

  He believed that credit department is providing the best service and customer complaints are not an issue for this department. Therefore, his perception of the problem was the poor services of other customer service departments that promote customer complaints about the overall services of the firm.

- CS expert from customer's general enquiries department

  She mentioned that she does understand the lack of knowledgeable CS employees can influence customer dissatisfaction but she did not have any suggestion that why there is lack of knowledgeable CS employees.

- Customers

  Although CMSorg has been investing on providing fast service in call centre – dealing with as many as calls as possible in the shortest possible time, however, it was identified that what is more important to customers is the accuracy of the information they receive and slow service, in most of the cases, is least important as long as the customer's case is dealt with accurately.

Part three. Creating credible problem resolution

Creating credible problem resolution without encountering significant disagreement between stakeholders requires skilled leadership that addresses the complexities associated with limited sense of shared characteristics and common knowledge. Schwarz emphasises that considering the group's concern during developing problem resolution, increases the effectiveness of the collaboration (2002).

Customer satisfaction is normally achieved when customers receive an optimal service without further concerns involved. The CKC team agreed that the lack of such service needs to be addressed by the Ep-s.

Part four. Engaging the participants in knowledge creation

1. CKC with customers

The only available and accessible method for engaging customers in knowledge creation analysing the data collected through telephone survey. Therefore, direct and person-to-person interaction between the researcher and customers were not possible. This omitted the need for assisting these interactions and customers had the chance to freely write about their perception and express their opinion without being interrupted or any other issues related to individuals' interaction in the process of knowledge transfer and knowledge creation identified in this research. However, the way the customers express and communicate their perspective and knowledge is not always easy to understand. Therefore, knowledge boundaries increase the challenges associated with this type of communication across stakeholder boundary. The only advantage of this type of stakeholder engagement in Ep-s is that it involves numerous numbers of customers that cannot be possible to be arranged in face-to-face discussions. To assure about validity and applicability of the feedbacks, the researcher used the same method illustrated in Figure 4-5.

Reading a large number of customer feedbacks one by one is, certainly, time consuming but this method enables the researcher to understand the factors affected customer satisfaction or dissatisfaction with the service or the service provider. Moreover, there are at least two different conceptualizations of customer satisfaction: one is transaction-specific; the other is cumulative (Boulding et al, 1993). '*From a transaction-specific perspective, customer satisfaction is viewed as a post-choice evaluative judgment of a specific purchase occasion*' (Oliver, 1997). '*Cumulative customer satisfaction is an overall evaluation based on the total purchase and consumption experiences with a product or service over time'* (Fornell, 1992), which is a more fundamental indicator of the firm's past, present and future performance. '*It is the cumulative customer satisfaction that motivates a firm's investment in customer satisfaction'* (Wang and Lo, 2003). To assess the comments based on these criteria, the relationship between the comments and account creation date was measured. Approximately 50% of survey respondents are the ones that have been supplied by CMSorg from the time it was established and the other 50% have been supplied by CMSorg about two years. These

significant percentages of cumulative customer satisfaction and dissatisfaction shows the trustworthiness of the data used for this project.

To maintain an accurate distinction between types of services that customers are dissatisfied with, the complaints had been further divided into two categories of 'Call Centre' and 'Excluding Call Centre'. Furthermore, and complaints about call centre (see Table 4-1), and complaints excluding call centre had been sub-categorised (see Table **4-2**). The percentage is calculated based on total number of comments in each category. Overall 18.33% of survey respondents are satisfied with services provided by call centre and 18.79% are dissatisfied; 28.67% are satisfied with services provided by CMSorg excluding call centre and 25.90% are dissatisfied.

Table 4-1. Breakdown of the customer complaints – call centre

Call centre Complaints		
Group	Type	Complaints (Dissatisfied)
Contacting	Time taken to get through an advisor	14.14%
	High cost of call	12.88%
		27.02%
Speed and quality of the service	Time taken to handle customer's issue/ long time on hold	3.64%
	Call interruption	1.31%
	Noisy and unclear line	1.16%
		6.11%
Advisor	Lack of courtesy and politeness of adviser	4.04%
	The advisor did not make customer feel valued	2.42%
	Adviser was not able to understand the issue and identify the problem	12.93%
	Lack of willingness to help resolve your issue	4.19%
	No call back as promised	1.62%
		25.20%
Standard of advice	The issue was not resolved to customer's satisfaction	20.20%
	Advice/issue was not easy to understand	6.01%
	Advice/ information was incorrect	4.85%
	Contradictory information	1.62%
		32.68%
General	Calling more than once for the same issue	**8.99%**

Table 4-2. Breakdown of Complaints – Excluding Call Centre

Complaints – Excluding Call Centre		
Group	Type	Complaints (Dissatisfied)
Billing	Dissatisfactory methods and process of refunds	1.40%
	Late or no bills	9.33%
	Inaccurate or incorrect bills	10.81%
	Dissatisfactory methods of payment (Strict and Inflexible)	8.08%
	Lack of transparency of the bills in pricing and billing structure	7.64%
		37.26%
Price	Low level of consumption and high cost (Unmeasured)	3.02%
	Too expensive	28.48%
		31.50%
Communication	Lack of internal communication (between departments)	1.51%
	Failure to keep customers informed	5.46%
		6.97%
General	Not done what they confirmed to be done	3.21%
	Not understanding individual circumstances	4.87%
	Dissatisfactory quality of service at customer's location	2.91%
	Dissatisfactory on-site works (Late or slow service)	3.32%
	Inaccurate system of storing customers' information	9.96%
		24.27%

The fundamental significance of boundary spanning has been identified, as that information about customer expectations from the service provider needs to reach the organisation in order that the gap between customer expectations and organisation perception may be minimised.

The analysis of customer complaints showed that more than half of customer complaints, followed by dissatisfaction with the service provider, were about the poor customer experience with call centre department in regards to handling customer queries. Call centre employees operate between the firm and its environment that represents the role of stakeholder boundary spanner. Therefore, this research will refer to *call centre employee* as *boundary spanner* from this point onward.

Transferring accurate knowledge or information from the firm to the customers is the primary responsibility of boundary spanner. The key factors identified through investigating and analysing customer complaints are as follows:

- Boundary spanner was not able to understand the complaint
- Boundary spanner was not able to identify the problem
- Boundary spanner did not resolve the problem to customer satisfaction

- Boundary spanner provided complicated advice
- Boundary spanner provided incorrect information
- Boundary spanner provided contradictory information

The above discourse shows that the poor knowledge transfer (KT) by boundary spanner creates knowledge creation barrier (KCb) which has significant influence on customer dissatisfaction with the service provider. Therefore, the first issue was identified as:

KCb 1. Poor knowledge transfer from the call centre employees to customers.

La and Kandampully (2004) explain that the experienced boundary spanners, who have significant knowledge about the firm's services and knowledge boundaries associated with customer's lack of experience, are able to address the problem more effectively than the less experienced ones.

To such aims, not only having quick access to information is sufficient. Customers' feedback shows that they know whether advisors are experienced or they just 'read a script'. Knowing the reasons leading to a request from a customer and how the information will help that customer to overcome the problem are two of many skills that staff must have in order for a customer to feel satisfied with the service provided. These issues underline the importance of knowledge transfer skills required by staff in transport-related organisations.

Stamper and Johlke (2003) remark that the way that boundary spanners interact with the customers has significant influence on customer's impression of the firm. Tax and Brown, (1998) emphasise that inexperienced call centre employees increase the dissatisfaction of customers with the service failure. Miller et al, (2000) affirms that dissatisfied customers become more understanding if the call centre employees demonstrate the willingness to address the problem.

The important point is that customers become more negatively disposed towards the service when they receive no concern from boundary spanner, and become more positively disposed towards the service when the boundary spanners accept the responsibility and understand the trouble the customer had been through, on the behalf of the company. The main reason is that although the boundary spanner did not cause the problem but in fact, they are representing the company for the customers, the boundary spanner is the company.

The customer feedback analysis also has shown that one in four complaints that involve customer service advisers are related to the lack of information and knowledge within the call centre at CMSorg. This confirms that not only attitude of call centre representatives but also information and knowledge available within the call centre could determine customer perception of the organisation and its services.

To investigate this issue and clarify the role of knowledge transfer from CMSorg to boundary spanners, the researcher took the field role of complete observer only during 2 days of CS training sessions and conducted open-ended interview with the CS expert – who had the role of training advisor. This observation and discussion facilitated in-depth understanding of knowledge transfer during the training sessions, for the researcher. Yin's (2014) remarks that observation also allows the researcher to evaluate environmental and social structures in practice.

The participants of the CS training were as follows:

- Training advisor (Credit manager)
- Training assistant
- Twenty trainees
- The researcher (passive role of complete observer)

This part of the training was on using the software available for accessing customer information and recording a brief on the boundary spanner's actions regarding to customer's case and CMSorg has to make this information available to external auditors. During the morning session, the trainees did not have access to the software and they had to learn how to find the information about the software from the manual. Although they needed to focus on the screen, look at the manual and taking notes at the same time, the ones sitting at the desks around the room could not manage all three and it slowed the training because the advisor waited every time that a trainee's attention was not on the screen. In the afternoon session, they had to practice what they learnt about the software on the computers, but eight of the computers were not working due to some external technical problem. Consequently, four trainees shared the laptop connected to projector and the other four worked in groups of two with other trainees. Figure 4-6 shows the structure of the room during the two sessions.

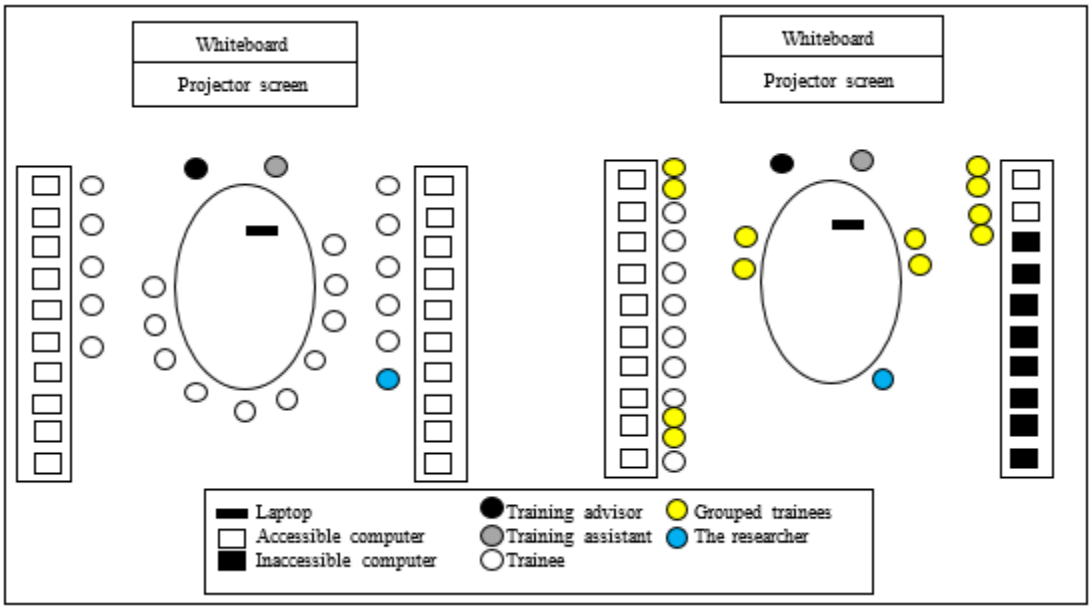


Figure 4-6. The layout of the training room

In the discussion between the researcher and the credit manager, he mentioned:

Most of the trainings I had before were with ten people and it was easier and faster for me that I and my assistant could monitor all ten continuously and I could move on faster as I could be sure if everyone understood the lecture or not, easier. Now with twenty people (double!) it is a bit slower and they might fall behind schedule, as today's session is now postponed to tomorrow. But at the end I will try to manage it.

The adviser shared examples of his experience and knowledge vaguely. Especially while mentioning the problems that trainees might face while using the software, he did not mention preventive actions. Moreover, the researcher found many customer complaints about different services provided by this part of call centre prior to attending this training and noticed that the advisor knew very few of them. For example, some of the customer complains show that they had to contact CMSorg the day after applying for specific credit service to seek help because they did not know about the processing time required and the boundary spanners did not inform the customer about this processing time either.

Training adviser explained that after a customer applies for a certain service, it takes three working days until it is actually processed, however, he did to highlight that boundary spanners should give this information to the customer before it leads to another complaint. This clarified the lack of efficient and effective knowledge transfer from CMSorg to

boundary spanners which identified the second issue related to customer dissatisfaction with boundary spanner as:

KCb 2. Poor knowledge transfer from relevant department to boundary spanners

The analysis of customer feedback also identified some of the CMSorg customer suggestions on keeping customers informed that are as follows:

- More information on projects you are undertaking
- News about what you are doing to improve your service
- Inform customers in advance, if there is service interruption
- Methods of saving or reducing consumption
- Opening hours along with contact numbers provided in letters
- Easier access to important information on the website

Keeping customers informed is an additional requirement in the current environment. Service consumers typically have limited knowledge of how the entire service system works (Gummesson, 1993). Although it provides the essential supports for front-line areas to create and deliver service, the unseen part of the organisation, often referred to as back-of-house areas, seldom receives recognition from the customers (La and Kandampully, 2004). In particular, keeping captive market informed has significant influence on their satisfaction with the service provider. Captive market knows that the service provider is the only firm in the market and they do not have any other choice of supplier of the specific service in their area. Thus, the customers becoming more concerned whether they receive the best quality of service or the organisation does not value their customers compared to if there was a competition on retaining customers.

The researcher's investigation of the information that CMSorg communicates with its customers and the result of discussion with business improvement analyst confirmed that CMSorg has covered almost all of these demands. However, the method of communication could have been insufficient that it did not cover informing all its customers and caused the knowledge transfer not being completely successful. Therefore, the third issue related to improving customer experience with CMSorg was identified as:

KCb 3. Poor direct knowledge transfer from CMSorg to its customers

In order to investigate other potential factors influencing customer dissatisfaction with boundary spanners, a series of CKC meetings were conducted with CS experts.

2. CKC meeting with CS experts

The researcher had series of open-ended interviews with CS experts from operation, credit and general enquiries departments to identify the issues related to poor knowledge transfer. At the time of conducting these interviews, the CS experts from operation have been working at the call centre for more than ten years, the CS expert from general enquiries had worked at call centre for some years and the CS expert from credit department has been managing the call centre for many years. Therefore, their experience significantly contributed to identifying issues related to customer dissatisfaction with boundary spanners.

The CS experts explained that in many cases customers cause the poor KT from boundary spanner for the reason that customers do not always explain their problem with the services in a clear and communicative manner. Moreover, sometimes customers are not even sure about what they want from the boundary spanner. The CS expert from general enquiries mentioned:

In many occasions, customers provide plenty of contextual details while describing their query and at the end, the point of their query became too complicated to understand.

Therefore, the fourth issue was identified as:

KCb 4. Poor knowledge transfer from customer to boundary spanner

The researcher suggested that the nature of service provided by CMSorg at their call centre recommends that there is a need for a range of knowledge resources to be shared between call centre employees in order for them to be able to provide customers with accurate and consistent information. All the CS experts mentioned the significant importance of being able to draw upon the accumulated knowledge and experience of one another at work. However, the tacit knowledge of boundary spanners is difficult to verbalise. Consequently, the fifth issue was identified as:

KCb 5. Poor knowledge transfer between boundary spanners

CS experts suggested CMSorg strategies must therefore involve call centre employees whenever the organisational knowledge (in the form of experience, skills or information) can lead to better customer service. Therefore, providing encouraging environment for boundary

spanners to feed their experience gained through dealing with customer complaints back to relevant department and lack of such an opportunity identified the sixth issue as:

KCb 6. Poor Knowledge transfer from CS to relevant departments within CMSorg

The researcher developed a network model to illustrate the proposed knowledge creation (KC) network and identified factors affecting poor knowledge transfer. This model is shown in Figure 4-7 (The two separate arrows instead of two-dimensional one represent the different type of poor knowledge transfer).

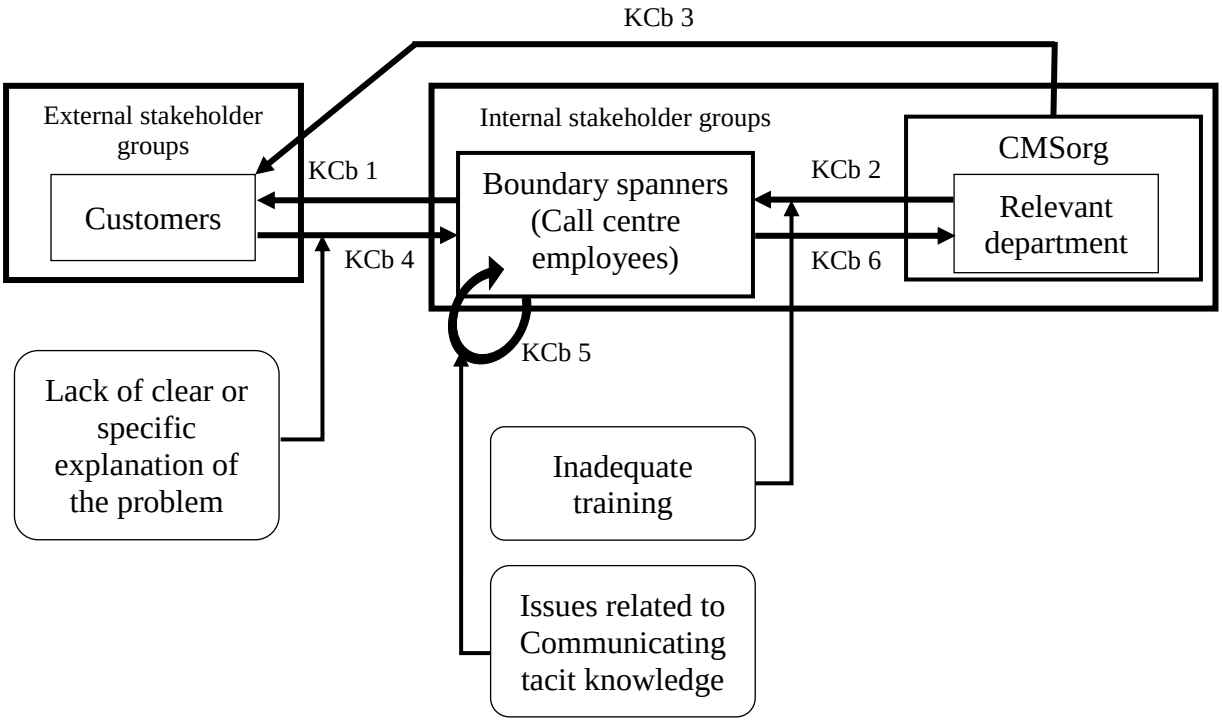


Figure 4-7. Network model of the factors creating knowledge creation barrier (KCb) – version 01

Phase 2 – Stage 2. Review and reflect

The fourth and last stage of the application of Ep-s is a review of the topics discussed during the previous stages of the CKC approach in particular during the CKC meetings. The review involves the CKC leader and participants which focuses on review and reflect of findings. review and reflect of the findings assists the participants to identify the areas that they can improve.

During the review and reflect meetings with CS experts, they affirmed that knowledge transfer from boundary spanners to relevant departments – the departments that can improve

their services by understanding the reasons affecting customer dissatisfaction with their performance – is not always a feasible action because boundary spanners often are reluctant to participate in such action. According to the CS experts the reason behind such unwillingness might be one of these:

- Conflict of opinion and organisational value
- Lack of openness around reporting
- Employee evaluation purpose versus service
- Departing employees

They pointed out that the boundary spanners need to address customer queries, even the ones that contain ambiguity. This requires skills and experience of handling highly varied, complex and distinctive customer needs. Their queries need to be addressed and although because of them not being able to explain their query, boundary spanner might fail to help them, this counts as poor quality of service – from customer perspective – followed by customer dissatisfaction. However, as they added, boundary spanner's lack of experience and communication skills adds to the challenges associated with addressing complex enquiries. Therefore, the factors influencing poor knowledge transfer from boundary spanner to customers which creates KCb are as follows:

- Highly variable, complex and distinctive customer needs
- Boundary spanner's lack of experience
- Boundary spanner's communication skills

Moreover, operation CS expert mentioned that the comments boundary spanners write about the need for follow up on customer complaint are often difficult to understand and the next boundary spanner might need to either contact the first one or seek for more information from the customer. This highlights that being frequently rotated and reassigned has negative influence on the efficiency of knowledge transfer.

The issues affecting knowledge creation identified during the review and reflect meetings are shown in the new version of the network model of factors influencing poor knowledge transfer. This version of the network model is shown in Figure 4-8.

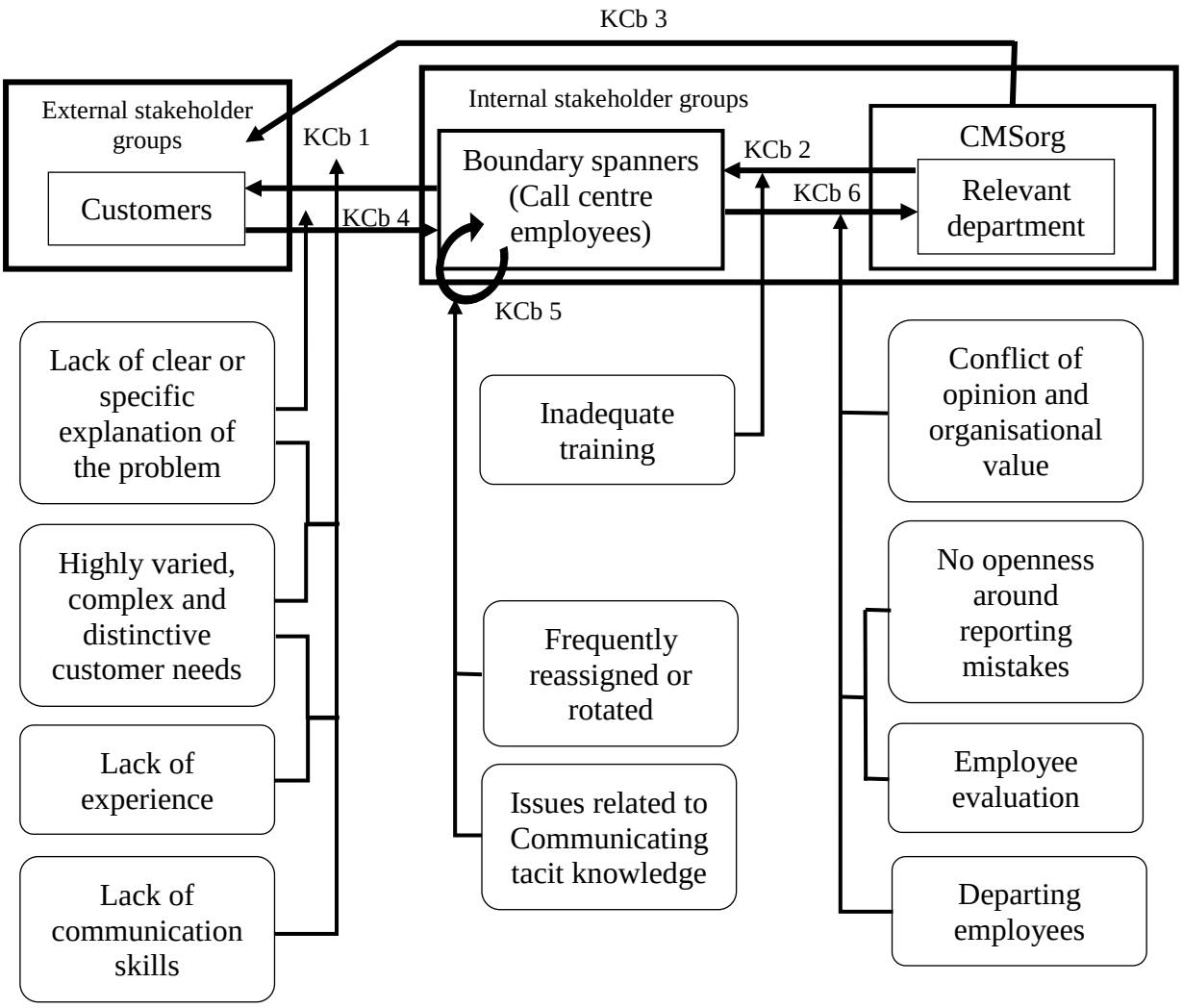


Figure 4-8. Network model of the factors creating knowledge creation barrier (KCb) – version 02

In concluding the description of Ep-s method for implementation of CKC, it is important to mention that specific aspects of this method still require analysis and development. However, the method is being presented with the stability provided by its application in different environments. The conceptual framework that presents the dimensions and relationship between the key stages of the implementation of Ep-s method are illustrated in Figure 4-9.

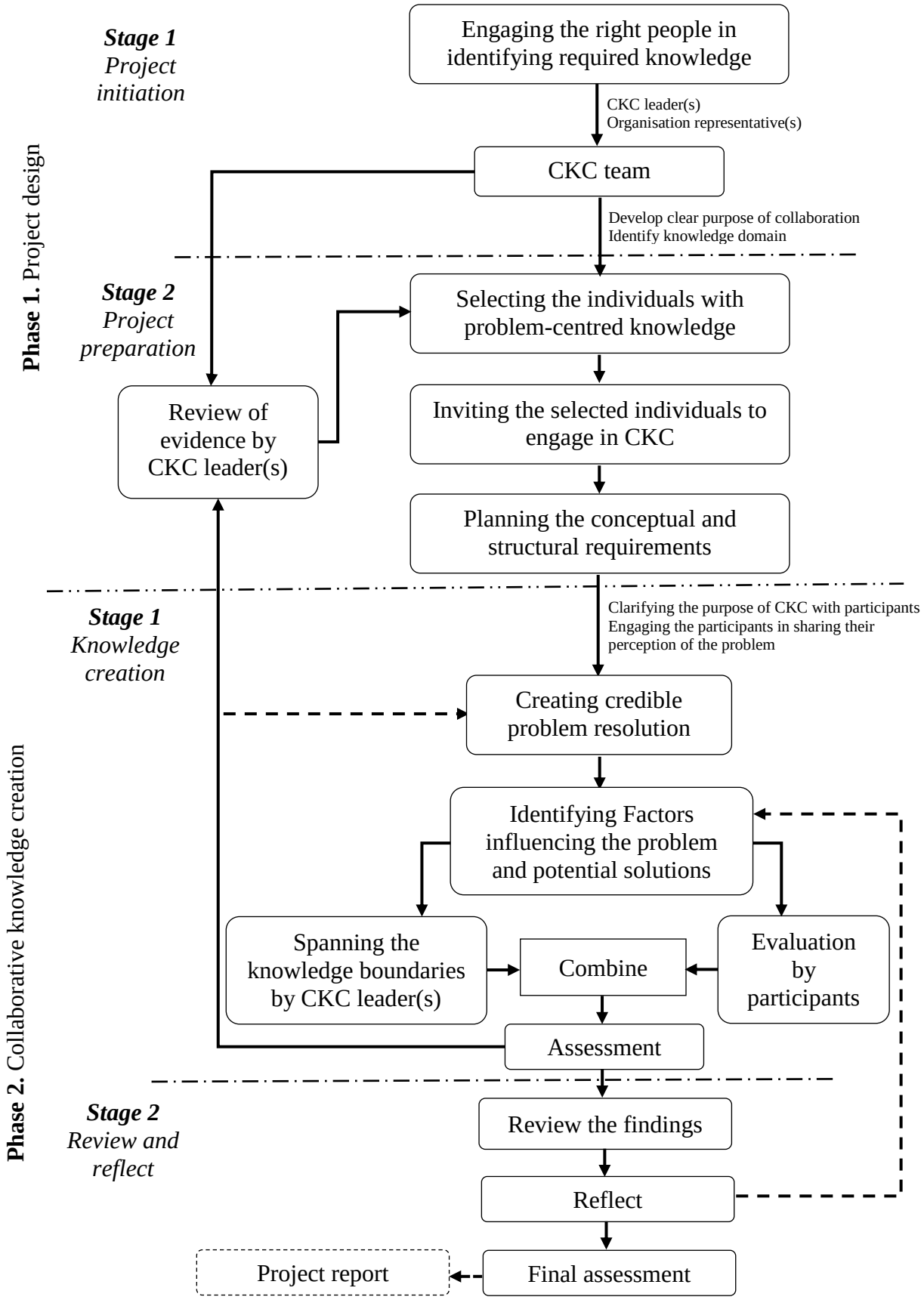


Figure 4-9. The dimensions and relationships between the key stages of the implementation of Ep-s method

4.3. Implementing a CKC project using Ep-s method

4.3.1. Introduction

The version of Ep-s presented in section 4.2 is the result of the evolution of the method that originated during CKC with service organisation, CMSorg. Another Ep-s exercise during CKC with service organisation followed the collaboration with CMSorg and has been chosen to illustrate how Ep-s can be run across service industry. It is important to mention that although Ep-s had improved significantly during its application, the process described in this section still has particularities that were not encountered in CKC with CMSorg. Therefore, despite the success of Ep-s, there still exists areas for continued improvement and development and for that reason; further applications are needed for all relevant issues to be fully understood.

Britain Rail Service (BRS), one of the research associations in the UK which is a partnership between rail industry and the UK universities, funded a collaborative project with Coventry University aiming at improving the safety of rail transport in the UK (Britain Rail Service is a fictitious name, used to preserve confidentiality and anonymity). This collaborative research project was the window of opportunity for applying Ep-s across the rail industry.

Provision of transport services relies on a combination of capabilities, involvement and performance of numerous, diverse parties. This causes inevitable challenge when data and expertise from all the parties are required for solving a complex problem. The challenge is even bigger when required data is incomplete, contradictory, complicated, indefinite, uncertain or inaccessible. To address this problem, a feasible and reliable approach is needed to first identify and represent dependencies of the sources of data and expertise related to the problem in hand and second to utilise the data and knowledge in an effective way. The need CKC across stakeholder groups within rail industry in the UK is illustrated in Figure 4-10.

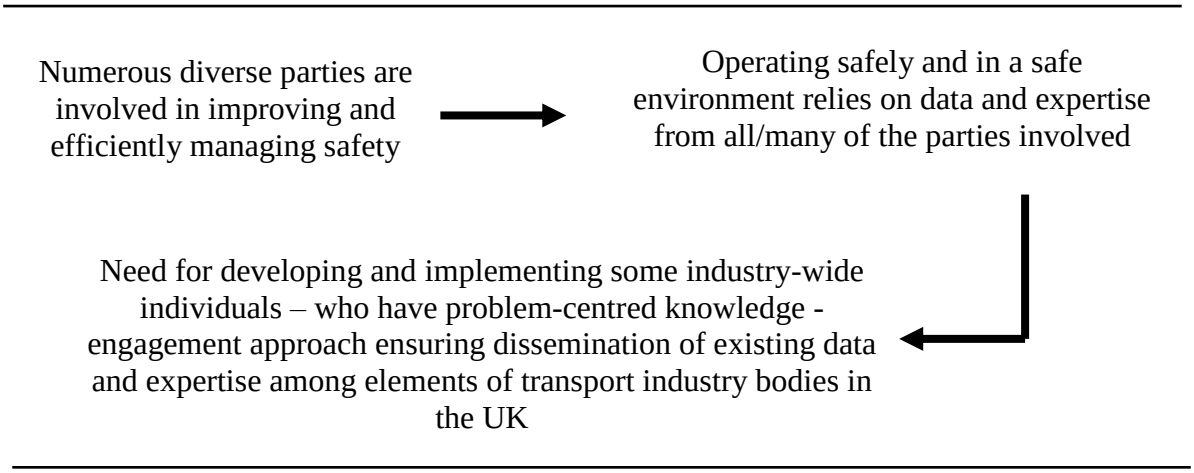


Figure 4-10. Model of factors shaping the challenge of managing safety in rail industry

Due to the nature of industry-wide collaboration, stakeholder groups would be located in different parts of the UK. Moreover, although individuals from diverse stakeholder groups have significant experience in their specific domain, only some of them have worked on rail safety related areas. Identifying and selecting individuals from a wide range of internal and external stakeholder groups who can contribute to the success of CKC was never a barrier to the Ep-s during collaboration with CMSorg. The same applies to this application of Ep-s for the reason that, as described in section 4.2.1, problem-centred knowledge is more important than individuals' expertise in the application of Ep-s. Moreover, geographically distributed customers – the largest stakeholder group in the case of CMSorg – with problem-centred knowledge was not a problem in previous application of Ep-s, however, in this application of Ep-s, engaging industry-wide distributed individuals needs to be addressed.

There has been a remarkable lack of studies to highlight the potential relevance of utilising data in line with expertise for the purpose of improving and managing safety. The aim of the collaboration project with BRS was to address such a challenge, therefore, this research has implemented the new approach to CKC, Ep-s, to enable knowledge transfer between knowledge resources and assist knowledge creation.

The stages of the first phase of the Ep-s, designing the CKC project, and the stages of the second phase, collaborative knowledge creation, will be described in this section.

4.3.2. Phase 1. Designing CKC project

Stage 1. Project initiation

Part one. Developing a clear purpose with CKC team and identify knowledge domain

This approach to collaboration assists stakeholder engagement in identifying the factors that affects the safety for the success of the transport industry in their efforts to manage safety effectively. By ensuring that all parties involved could contribute their knowledge and also benefit from the problem-centred knowledge of others, the purpose of collaboration was to assist knowledge transfer across the industry and develop solution for better understanding of the factors related to safely and while also providing the basis for further safety-related collaborations. The project proposal clarified this purpose and the two initial stakeholder groups – research group from CU and representatives from BRS – understood the purpose explicitly.

It was clear that one of the key areas of concern in transport has been improving and efficiently managing safety. Operating safely and in a safe environment relies on many databases and work of many parties involved. This highlights the value and potential uses of transportation safety data and expertise and the need for developing and implementing an industry-wide stakeholder engagement approach, ensuring dissemination of existing data and expertise among elements of the transport industry.

Part two. Engaging the right people in identifying required knowledge resources

Designing this collaboration required three essential sources of knowledge that are as follows:

- People with knowledge about factors that affect the rail safety who can conduct intensive investigation of stakeholders who have safety-related knowledge

The BRS representatives involved in identifying the stakeholder groups who have safety-related knowledge and can contribute to the effectiveness of this collaboration. The work of this organisation revolves around development and knowledge creation that requires collaboration with many different parts of the industry.

The project leader, KET research expert from CU, and the representative from BRS communicated the details of potential stakeholder groups by e-mail throughout this design

phase. The project leader informed the other researchers about the potential stakeholder groups in the research group meetings.

- Researchers who can collect the required safety-related data for developing initial safety models

The CKC team at this stage were four members of the research group from CU that are as follows:

- The researcher (CKC leader)
- KET research expert (CKC leader)
- The BRS representatives (CKC leader)
- Two research and software-design experts – who could assist the CKC project where software programming was required for presenting factors related to safety issues – identified the initial sets of safety-related data and developed some sample models.
- Number of individuals with safety-related knowledge from different organisations within rail industry

The CKC team, communicated through e-mails, telephone and had series of face-to-face meetings to review and discuss the relationship between project objectives and potential stakeholder groups, and, they engaged through virtual environment only for sharing data and explicit ideas (The communication between the members of CKC team at this part is included in appendix A).

This extensive research was conducted with the objectives that are as follows:

- Identify and understand the nature and structure of key data streams within the different sections of the rail industry.

- Outline the relationship between such data sets into a series of models using suitable modelling tools and techniques.

Several sections of the rail industry (e.g. infrastructure owners, operators etc.) were contacted with the aim of identifying and understanding their key data stocks and data flows.

The complexity of the rail industry and the volume of data sources presented a challenge to collecting and analysis of data, therefore, a series of models were developed based on the

literature available, data resources and data structures provided by some stakeholder groups. One of these models is shown in Figure 4-11.

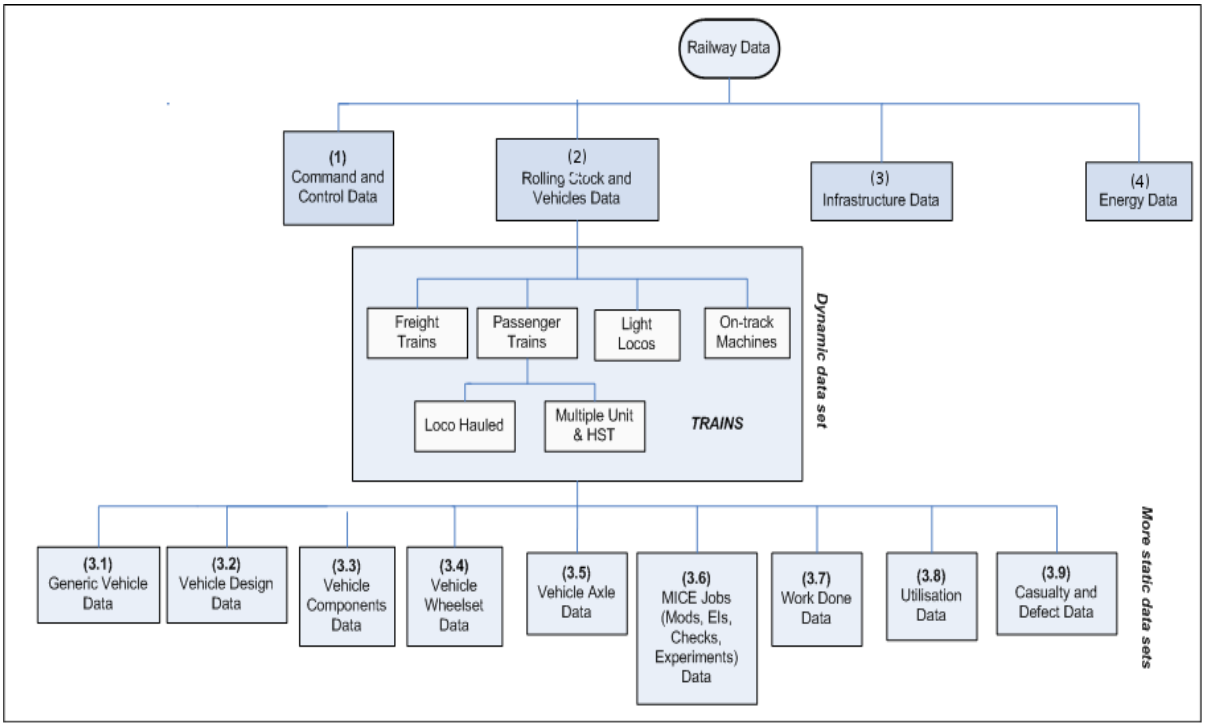


Figure 4-11. One of the models developed by the research team

Developing these models helped the researchers to better understand areas of work of the potential stakeholder groups.

Stage 2. Project preparation

Part one. Selecting individuals with problem-centred knowledge for CKC

Implicit in safety-related decision-making is domain-specific knowledge that is difficult to derive, build and model for decision making. One source of such knowledge is professionals (from safety engineers to signalling operators) in the domain that brings with them sources of implicit knowledge and point to explicit repositories. This is one important resource of knowledge used in the Ep-s approach to CKC within rail industry.

It was noted that different stakeholders within the UK rail industry collect (and in many cases own) data which is not always available to other sectors of the industry. Therefore, expertise from different sections of the UK rail industry (i.e. infrastructure manufacturers, owners and operators) were evaluated to first identify and later understand their key data stocks and data flows and, more importantly, the perceived relevance of such resources for understanding

safety. Consequently, the selection of stakeholder groups included academic partners, safety and data experts from the main sections of the rail. In addition to research group from CU, twelve senior managers who have safety-related knowledge from eight sections of rail-related firms were selected to participate in the CKC who can contribute to its purpose.

Part two. Inviting the selected individuals to engage in CKC

In an industry such as rail, where radical knowledge creation will take place within the near future, learning from experience is an effective approach to understanding safety.

Such learning from experience relies on two main resources: the volumes of data already available and the knowledge of rail and safety experts. Experts' knowledge is essential in the process of understanding the interrelation between all components of the rail industry (e.g. infrastructure, passengers, systems etc.). It would enable the industry to extract meaning from the data available. Therefore, the aim was to involve key experts from the UK rail industry in CKC.

The CKC research team considered the two important elements of inviting stakeholders to engage in collaboration that are who and when to invite. The research team decided to recommend two different dates to make it more flexible for the potential participants. The project leader sent the meeting invites to the potential stakeholder groups two months prior to the event and kept track of the responses. The content of the invite is included in appendix A.

Part three. Planning the conceptual and structural requirements

In the previous application of Ep-s, during collecting data about customers' experience with the service provider, there was no need for preparing the environment for effective CKC. Moreover, other participants were from one organisation and ready to contribute to its improvement and better performance, they had very similar problem-centred knowledge and they were not concerned about any negative impact of sharing their experience. In the industry-wide application of Ep-s, however, the conditions are more complicated. To address this challenge, this research used a new description for CKC meetings, *Design-shop*. Burck (2014) emphasises that Design-shop is a facilitated environment within which people who have a key stake in the required change meet and contribute to problem solving. The description of Design-shop will be included in this section.

Siekman (2001) remarks that Matt and Gail Taylor developed the concept of Design-shop in the 1980s to encourage creative collaboration between members of a group beyond the conventional group works. He explains that the Taylor approach supports engagement of diverse groups of stakeholders in solving complex problems through knowledge transfer and designing solutions that fosters knowledge creation. Burck (2014) explains that the concept of the Design-shop collaboration distinguishes it from the traditional workshops for number of reasons that are as follows:

- In this type of collaboration, the focus is on meaningful problem-related conversation between the participants. It facilitates parallel work of small groups to enhance the chance of better understanding of the participants' perspective.

- One of the characteristics of Design-shop is that it is a focused collaboration approach and maintains collaborative experience.

- Design-shop provides iterative and non-linear process that supports better understanding of the root causes of the problem through sharing problem-centred experiences in advance to creating the final designs of the solutions.

- Developing a collective vision that emerges in non-linear collaboration is the result of skilful facilitation of feedback loop that feeds back on the development of the components of final solution.

- Shared experience advanced during the Design-shop collaboration facilitates creating new patterns of thought and action and it integrates individual's characteristics into a collective identity.

Burck emphasise the effort of leader in Design-shop collaboration is essential and has direct influence on the success or failure of the collaboration. Gavrilova and Andreeva (2012) describe that level of involvement of the leader and participants and the type of interaction between them in three categories that are as follows:

1. Active involvement and interaction method. In this method the leader leads the collaboration through asking questions with the aim of knowledge elicitation from participants

2. Passive involvement and interaction method. In this method the leader facilitates engagement of participants in leading the collaboration, therefore, the role of the leader can be just to listen or observe and then analyse.
3. Equal involvement and interaction method.

High amount of uncertainty adds to the limitations of collaboration between independent units, therefore, trust is a key factor for investigating variation in the outcome of inter-organisational collaboration (Bstieler *et al.*, 2017). Therefore, for successful collaboration, *trust* is essential. In particular, in inter-organisational collaboration, trust has fundamental role. Moreover, Carlile (2004) emphasises that lack of common interest among the participants creates pragmatic boundaries and dealing with conflicting interests requires significant practical efforts.

Bstieler *et al.* (2017) describe the evaluation of the success Design-shop followed by knowledge creation in three categories which support the development of mutual trust between the participants that are as follows:

1. Demographic similarity. Demographic characteristics include age, gender and background. In collaborative knowledge creation context, demographic similarities in levels of skills, experience and problem-centred knowledge plays an important role in the success of collaboration. Tsui *et al.* (2002) remark that, demographic similarities in the levels of experience and knowledge can have positive initial influence on trust.
2. Reciprocal communication. Through working together and building mutual perceptions, participants gain trust. This is more feasible through two-way communication (Bstieler and Hemmert 2008) where the collaborators develop understanding about trustworthiness of each other which promotes willingness to engage in knowledge transfer and collaborative knowledge creation (Ferrin *et al.*, 2008)
3. Decision process similarity. Decision process can be described as a combination of the degree to which participants share similar decision making styles that leads to trust and improves the conduct of collaboration sessions. Levin and Cross (2004) explains that participants reveal greater trust in collaborations where they have similar goals and decision process. Moreover, common understanding of collective goals and ways of acting provides a reliable foundation for trust.

Vanneste *et al.* (2014) remark that trust can depend on the length of the relationship. Schilke and Cook (2013) explain that the development of trust over time can be explained as relationship maturity. Bstieler *et al.* (2017) emphasise that relationship maturity has great positive influence on the effectiveness of the three categories discussed above followed by improving the mutual trust between participants in collaboration session. This relationship is shown in Figure 4-12.

Some materials have been removed from this thesis due to Third Party Copyright. The unabridged version of the thesis can be viewed at the Lanchester Library, Coventry University.

Figure 4-12. The factors influencing mutual trust in collaborations (Bstieler *et al.*, 2017)

In addition to developing trust among participants, pragmatic boundaries are the most difficult and complex to address in Design-shop activity due to the differences of interest that exist between individual participants or different groups of participants. Carlile suggests that both object/model and maps are appropriate boundary objects for this context (2004). This is because the development and use of maps allow people to better understand and appreciate the differences of interest that exist, while the use of objects/models can provide a resource which not only allows people to develop a sense of shared interests and common endeavour, but which also allows people to transform their knowledge to achieve a collective goal. Thus, with the spanning of pragmatic boundaries, the primary knowledge process is one of transformation.

Structural requirements for the design-shop

In the previous application Ep-s, the structural arrangement of CKC meetings did not require any specific technique. Although the number of customers who participated in transferring their problem-centred knowledge with CMSorg was enormous, this data was stored and there

was no requirement for any further person-to-person interaction for data collection. Moreover, number of experts required for the Ep-s was very limited and the duration and location of the field research – the same building as the CS experts were located – made conducting informal face-to-face discussions could take place at the researcher or expert's desk. In the application of Ep-s industry-wide all these conditions are different. The research team decided that the arrangement of tables in room required for the collaboration session has to be in the U shape to facilitate learning through conversation. By following KET research expert's experience from similar projects such as those reported by García Pérez and Ayres (2009, 2012). This included, for example, as follows:

- A U layout for the room that enabled visibility and collaboration
- Availability of drawing facilities such as flip chart sheets and whiteboards

4.3.3. Phase 2. Collaborative knowledge creation

Stage 1. Knowledge creation

Context chart – a network, mapping the interrelationship among the roles and groups (Miles *et al.*, 2014) – for stakeholder groups that engaged in the intensive two-day collaboration Design-shop is shown in Figure 4-13.

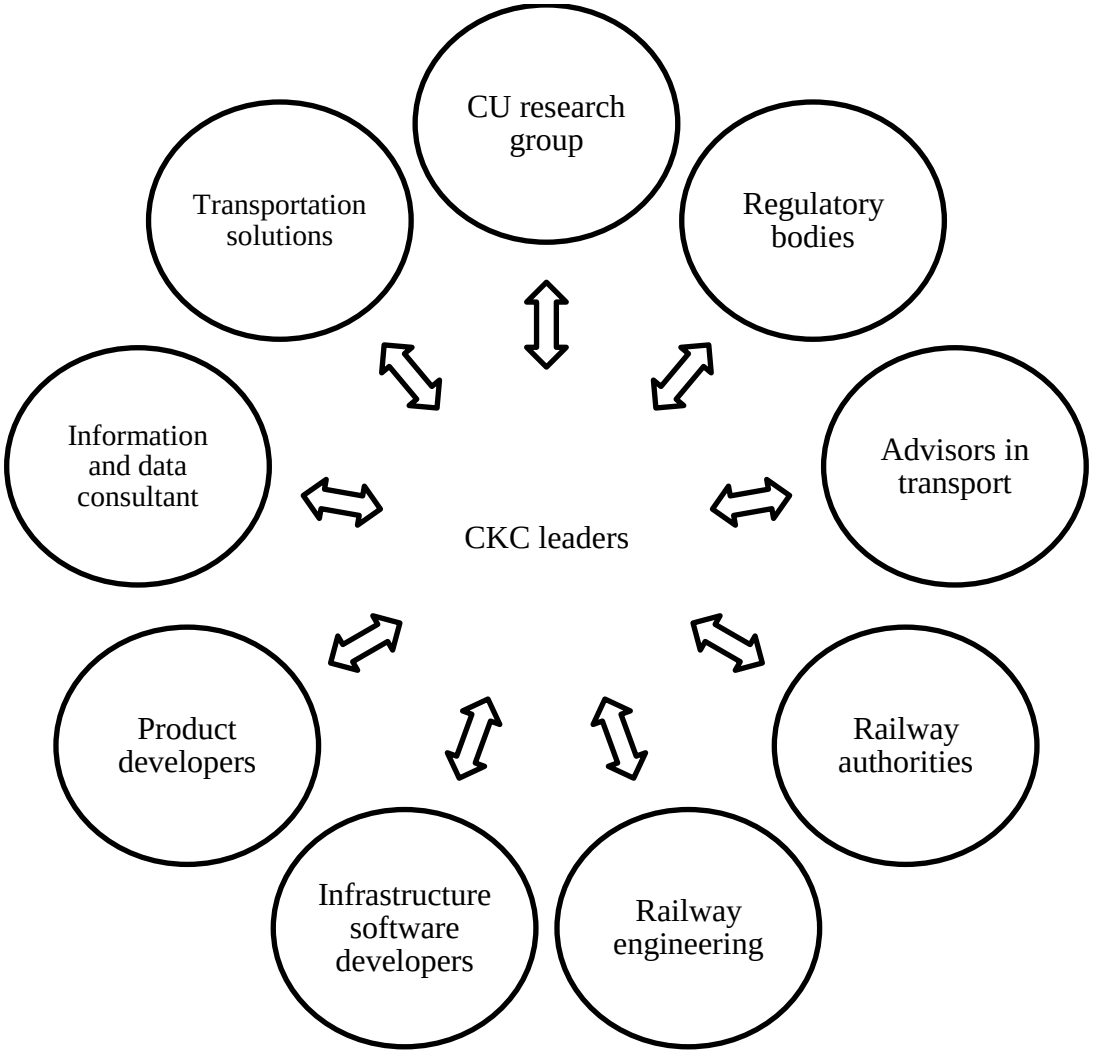


Figure 4-13. Context chart for stakeholder groups participated in the CKC

Part one. Clarifying the purpose of CKC with participants

In the start of the Design-shop, stakeholders' attitude was defensive and focused on least compliance as opposed to seeing railway safety as being part of their broader role in the industry. Within the first hour of the first session, there was general frustration and discomfort in communicating between stakeholders due to divergence definition of safety and its importance for each group of stakeholder within the railway industry. In addition, the possibility of being selected as the responsible stakeholder for the unsafe environment deepened the pressure across the group of participants and the unwillingness to listen to one another.

The facilitator wanted to challenge and break down their usual pattern of not accepting the railways' safety dependence on the effort of almost all the stakeholders within this industry.

One hour later, the communication form shifted, dramatically, from defending one's own performance to collaboratively focusing on finding answers to the bigger questions.

Part two. Engaging participants in sharing their perceptions of the problem

The topic was too generic. Although appropriate initiatives such as clarity of topic in the inviting phase, adjusting different perspectives and expectations right at the beginning of the session, and sharing experience took place to understand the influence of the problem on each participating stakeholder group, the perception of participants varied, significantly. The need for co-creating of topic clarity with the participants was inevitable. It became necessary to clarify what railway safety means and distinguish between risk management and safety management. In order to do this, participants engaged in creating a series of question to be answered Figure 4-14. This resulted on clarification of the concept of safety (see Figure 4-15)

Q. Is there a railway definition of safety?
Q. Is there a standard "proven" for Fmeca/ Risk/ Fault tree analysis?
Q. Are there any 'cultural approaches' to reduce risk of safety related incidents or otherwise?
Q. Is the railway aware of EFQM + its processes, Quality ≡ Safety in principle?
Q. How do we develop standard process?

Figure 4-14. A series of questions that supported co-creating of topic clarity

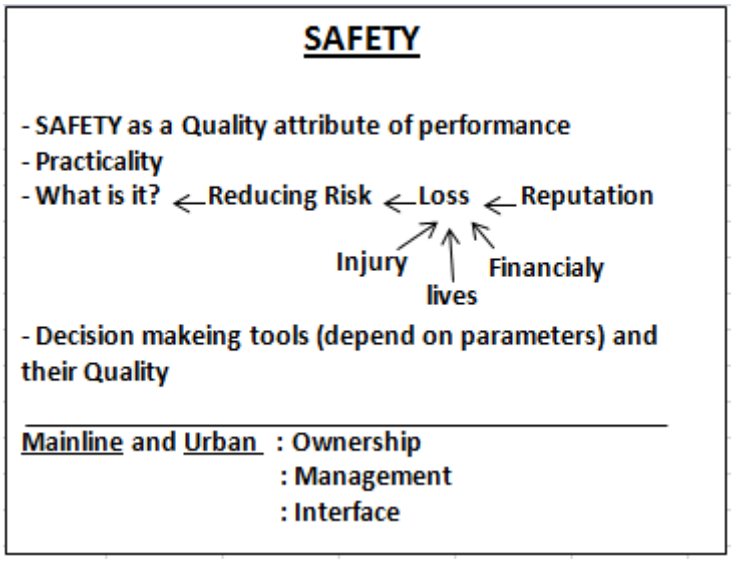


Figure 4-15. Co-creating of topic clarity

Part three. Creating credible problem resolution

It was important to create credible problem resolution that covers the wide range of factors that have many different influences on safety. This was facilitated through engaging the participants in developing models that illustrated the relationship between those factors and their influences. One of the many models developed in this Design-shop is shown in Figure 4-16 (These models were reproduced in Microsoft Office format to retain a clearer version of soft copy for participants and this research. A sample of this format is shown in Figure 4-17).

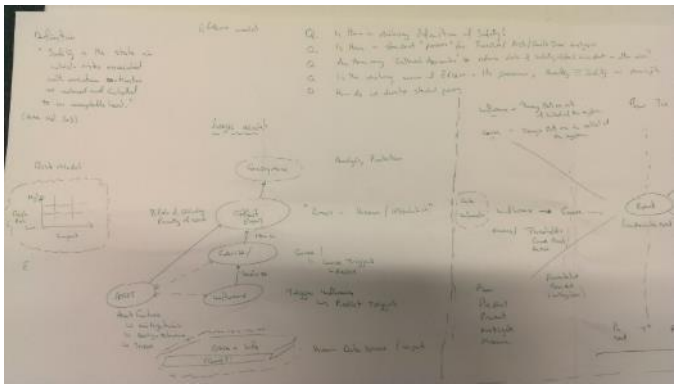


Figure 4-16. Creating credible problem resolution (Mapped by participants)

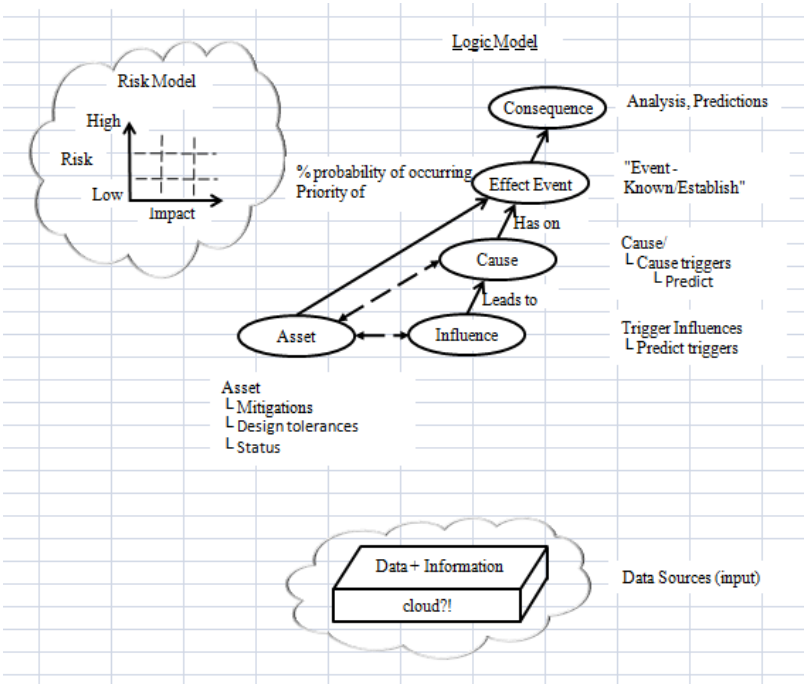


Figure 4-17. Creating credible problem resolution (Microsoft Office version)

Part four. Engaging the participants in knowledge creation

During the first day of the Design-shop, the group focused on rail data and its management in two parts. During the first part, all the stakeholders participated in the discussion and the group designed a precise model of 'whole system approach' which is shown in Figure 4-18. (The model was reproduced in Microsoft Office format to retain a clearer version of soft copy for participants and this research. A sample of this format in miniature scale is shown in Figure 4-19). During the second part, the facilitative leader divided the stakeholders into two groups, each group collaboratively added the relevant element to the models and at the next stage, the whole group designed the comprehensive models by sharing their findings.

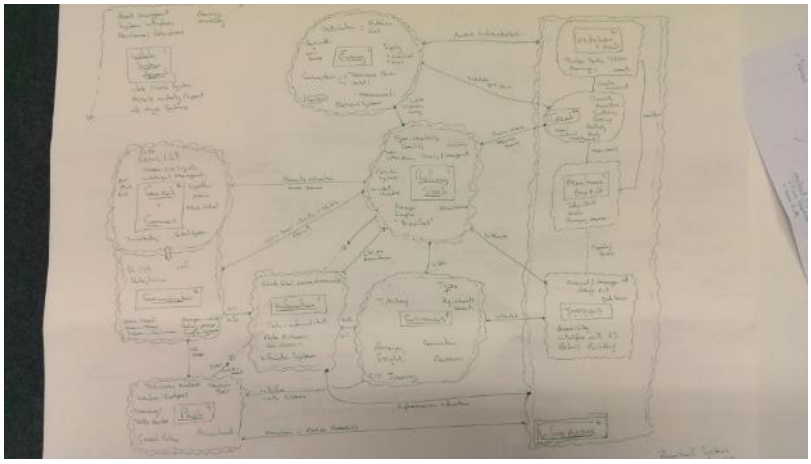


Figure 4-18. Collaborative modelling of the factors influencing the problem (Microsoft Office version)

Figure 4-19. Collaborative modelling of the factors influencing the problem (Mapped by participants)

The collaborative exercise was not only an opportunity for rail experts from across the industry to exchange their views on key issues of common interest. It also highlighted the need for industry to have a common approach to questions such as the safety of new IT-based products and services for the railway and further, the need for new strategies to use experts' views in understanding safety.

The discussions were informed and initiated by the notions of rail data and safety already developed in the designing phase. Participants were encouraged to review the models and add any comments or further suggestions.

Many years of experience within a highly fragmented environment allowed the experts to lead the way in reviewing the model. Participants highlighted how new developments such as availability of wireless access to the internet in the stations may on one hand is desirable while on the other hand, have increasing safety implications.

Having created initial models for railway data and safety, the researchers focused on the elicitation of knowledge of railway operation and performance from railway experts in the form of metadata-driven knowledge models, with focus on factors of safety concern.

Stage 2. Review and reflect

The concept of knowledge creation essentially represents methods and tools that facilitate efficient and effective problem-centred knowledge transfer and knowledge creation. Experts can describe systems in a variety of ways and with different levels of abstraction.

The researcher acknowledges that the depth of the knowledge elicited is limited to a high-level understanding of the domain. The limitation is due to two main factors, namely (1) the complexity of railway safety domain and (2) the limited availability of experts. However, the value of such knowledge resides in the number of key safety concepts and relationships identified by experts and the fact that knowledge models emerged as a result of a collaborative exercise where achieving experts' agreement was paramount.

In the second part of the first day of Design-shop, participants were divided into groups in which they were asked to investigate one main area of safety – Platform Train Interface (PTI) incidents.

Three models were produced by experts at the Design-shop to represent different approaches to understanding safety in the future. These covered some factors as follows:

- An overall railway system approach to safety
- An application of the EFQM model to railway systems as understood by participants
- An understanding of safety management based on London Underground's operation

These models were produced by experts at the Design-shop based on their expertise and experience that are as follows:

- The models developed by the project team prior to the Design-shop.
- Key safety-related concepts extracted from those models by experts.
- Existing documentation of the rail industry available in the literature or from other sources which helped participants to understand its operation

In the last part of this part of the Design-shop a software tool was developed to allow the Railway Expert to:

1. Use data already available and its quantitative analysis to consolidate, improve and reorganise where necessary the qualitative models of rail operation and safety into more elaborated and accurate knowledge representation structures.

2. Use the resulting probabilistic model to generate meaningful prognostics information from data available and visualise such information in a way that supports prediction of safety violations.

Experts at the knowledge creation Design-shop agreed that Platform-Train Interface (PTI) incidents are among those that need continuous attention by the railway industry. During the second day of the Design-shop experts focused on identifying the key factors influencing a safety incident, and drawing from their expertise in the collection and analysis of data, the relationship between such factors, informed. The diagram shown in Figure 4-20 was outlined by experts.

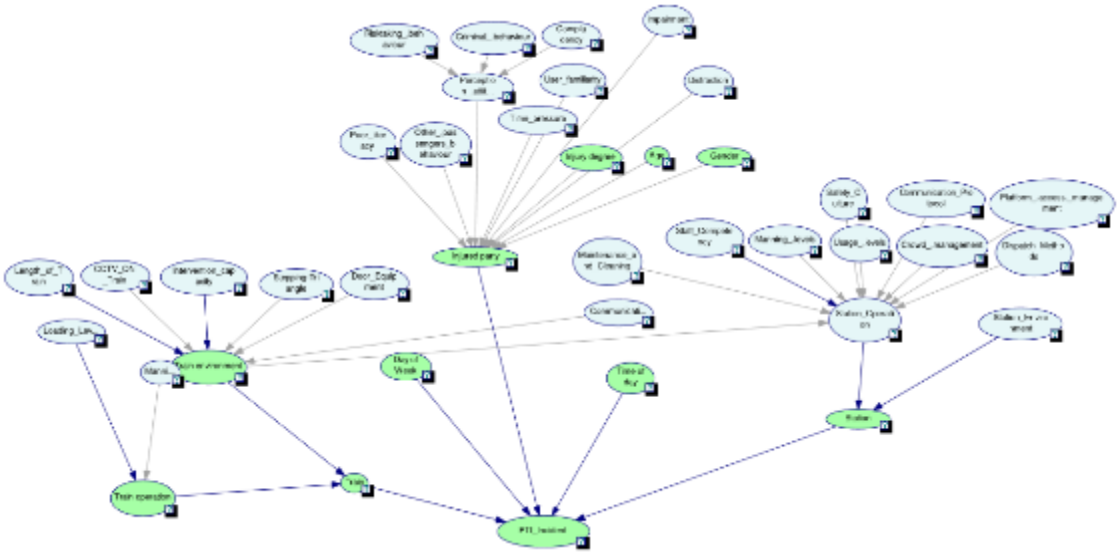


Figure 4-20. A reduced version of the PTI data model as outlined by experts

The Safety Prognosis tool becomes a graphic interface for the Rail Safety expert, which combines functionality for creating models of railway data and its relation with safety-Running simulations that are as follows:

- Using historic railway data to analyse trends or factors affecting or leading to safety incidents, e.g. relationship of Platform-Train Interface (PTI) incidents with foothold and age profile in the past year, and
- Running exploratory, probabilistic inferences based on the likelihood of safety incidents, given specific, hypothetical assumptions, e.g. how an increase on footfall at station X could affect the likelihood of a PTI incident.

The results of this and similar PTI-Footfall simulations have been presented to safety experts from the rail industry. Their feedback shows that the Safety Prognosis tool supports the industry in their efforts to understanding the potential effects of footfall in PTI safety incidents so that right decisions are made to minimise risks in predictive footfall situations. Ultimately, this is an evidence of the validity and value of the knowledge elicited from railway experts using the new approach to CKC developed in this research.

Key developments during the design-shop are as follows:

- Discussions of different views of safety, its probabilistic nature, its reliance on a number of human factors and the approaches to understanding and addressing these by different organisations within the railway industry

- Identification of several safety-related data sources and provision of relevant data samples by participants
- Collaborative development of a series of models of railway operation and railway safety

4.4. Summary

This chapter presented the origins and foundations of the new approach to CKC, Ep-s, in organisation within service industry based on assisted collaborative use of problem-centred knowledge.

Ep-s has been described as a method for implementing the proposed approach in service organisations. The characteristics of this method can be described in three steps that are as follows:

1. Creating credible problem resolution
2. Communicating perceptions of the problem across knowledge boundaries
3. Identifying and engaging individuals with problem-centred knowledge

These characteristics and the relationship between them and success of CKC have been described and an application of the method has been included in this chapter which can assist the service organisations in the process of implementing this or similar methods.

The application of Ep-s during collaboration with BRS has specified the methods reliance on the context. For example, during the development of Ep-s through collaboration with CMSorg, individuals were intrinsically motivated to share their knowledge with peers because they were all members of the same team, and knowledge sharing was a priority for the organisation. Moreover, the number of experts was limited and they were from one specific service organisation and for these reasons, researcher's knowledge was efficient for leading the CKC. However, implementation of Ep-s during the collaboration with BRS has identified that identifying and engaging individuals from diverse stakeholder groups requires a more collaborative environment and CKC leadership experience. Nevertheless, addressing these issues and the successful application of Ep-s verified the flexibly of the method to be adapted to the requirements of effective CKC. It has also highlighted its feasibility to produce

both implicit and explicit outcomes which may become particularly relevant for an organisation or organisations within a specific domain.

CHAPTER FIVE

5. APPLICATIONS OF THE NEW APPROACH TO COLLABORATIVE KNOWLEDGE CREATION IN THE FIELD

The review of the literature, presented in chapter two, described the need for collaborative knowledge creation and the key limitations of exiting approaches. Chapter three described the research designed employed in this research to address some of these limitations and chapter four included the dimensions of a new approach to collaborative knowledge creation which were developed and implemented as part of university-industry collaborations with two different service organisations from two different service industries. In order to provide more specific information for the purpose of the assessment of the validity of this new approach, this chapter includes detailed description of data collected during the process of applying and refining the new approach.

5.1. The extent of the data collection process

5.1.1. The relationship between research problem and process of data collection

After identifying the need for new approach to CKC, the development and assessment of a new approach had become the focus of this research to answer the primary, general, research question outlined in chapter one which is as follows:

> ***How to reduce the limitations of existing approaches to collaborative knowledge creation in service industries?***

Miles *et al.* (2014) remarks that conceptual framework explains the key factors, variables or constructs to be studied which helps researchers to be selective and, as a consequence, decide what data should be collected and analysed. In order to do so, the researcher identified secondary, more specific, questions to consider areas that might influence the aim of the primary research question and she was keen to address them only as much as it was relevant

to this research context (The descriptions of these research questions are included in chapter one). Analysis of this set of research questions assisted the researcher to design a conceptual framework, which is shown in Figure 5-1, to select and follow the key issues in the process of data collection.

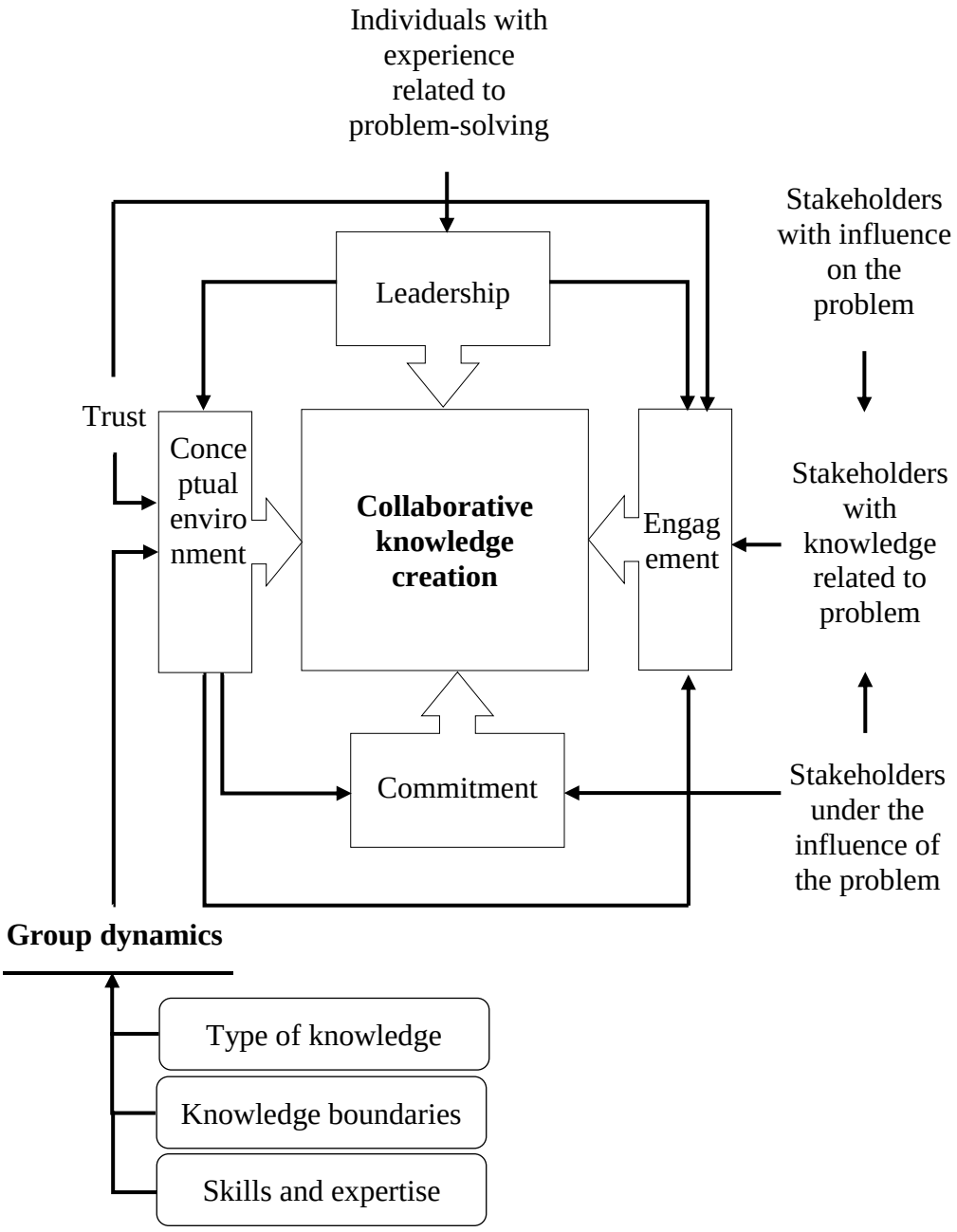


Figure 5-1. A conceptual framework designed for the study of the new approach to CKC

The researcher attempted to collect primary data from the real fields to develop and then assess the feasibility of the new approach to collaborative knowledge creation and its

potential quality to eliminate or at least minimise some of the key limitations of existing approaches that are as follows:

- Knowledge boundaries are addressed to improve the complexity of knowledge sharing between different stakeholder groups who have diverse identities and problem-related knowledge
- CKC leader(s) assist knowledge creation through an active control of the group dynamics
- Inviting the right people to engage in co-designing the collaboration supports selecting right stakeholders to engage in the co-creation of new knowledge
- Clear purpose of collaboration and credible problem resolution are addressed to promote efficient knowledge creation and effective problem-solving
- Identifying the factors influencing the problems facilitates addressing complex problems
- The new approach facilitates a collaborative environment within which all the participating stakeholder groups contribute their problem-centred knowledge and benefit from the knowledge creation
- The new approach facilitates the measurement of CKC effectiveness and success

In order to facilitate verifying findings and conclusion of this research, which will be described in detail in chapter six, the researcher considered three essential factors during data collection process that are as follows:

- Selecting units of data which are most important and relevant to addressing research questions
- Displaying the selected units of data in a meaningful way
- Using these displays to draw conclusions on the validity of the new approach to collaborative knowledge creation

5.1.2. Methods employed for data collection

The nature of research problem showed that empirical research is required to develop a new approach to CKC. Moreover, to refine and assess the validity of the new approach, the researcher needed direct experience from the field. Therefore, data collection process presented in this research is driven by collaborations between the researcher and number of

real organisations based in the UK throughout the development and implementation of the new approach to CKC.

Yin (2014) emphasises that multiple case study research helps the researchers to gather compelling evidence and develop research that is more vigorous. Yin's multiple case study design that in relation to research question consist of set of two or more cases with exemplary outcomes was employed in this research to support the applications of the new approach to CKC. As part of the multiple case studies, two CKC projects were conducted with two different service organisations from two privatised service industries. The service organisations involved are as follows:

- CMSorg (CMSorg). The new approach to CKC was conducted between May 2012 and March 2013 and between January and March 2013. The participants were from three different groups that are as follows:
  - Coventry University
  - CMSorg internal stakeholders which involved four different departments
    - Customer Insight and Assurance Team > Customer Relations
    - Operation
    - Billing
    - General enquiries
  - Customers that create CMSorg key and largest external stakeholder group
- Britain Rail Service (BRS). The new approach to CKC was conducted between June 2013 and April 2014. The participants were from three different groups that are as follows:
  - Coventry University
  - BRS
  - Eight leading organisations within rail industry. The areas of work of these stakeholder groups are specified in chapter four, Figure 4-13.

The researcher clarified the need for empirical multiple case study research and in order to attain required data through the application of CKC during the collaborative projects with the service organisations, she arranged the description of the sets of data to be collected, the methods to be employed for collecting them and estimated the outcome. These are described in Table 5-1.

Table 5-1. The set of data collected during CKC projects in the field

Project stage	Method	Format	Data and its Application
Initiation	Discussion between CU research team and potential service organisation	E-mail Meeting notes	communicate organisation's current problems Recommend CKC and its potential benefits for the organisation Ep-s evaluation in terms of motivation for problem-solving
	Communication between research team members	Meeting notes E-mail	Identifying available resources to support the conduct of CKC project Ep-s evaluation in terms of the need for CKC leader
	Discussion between CU research team and the organisation's representatives The researcher's observation	Meeting notes	Clarifying the purpose of CKC Ep-s evaluation in terms of selection of the knowledge domain Ep-s implementation in terms of improving the researcher's understanding of the knowledge domain and noting the factors influencing the interaction between CU research team and CMSorg representatives during explaining, understanding and describing the knowledge domain
	Documentary evidence	Text document	Information about knowledge domain, reports from relevant previous project and sample data Ep-s implementation in terms of improving the researcher's understanding of the knowledge domain
Preparation	Communication between the CKC leader(s) and the organisation's leader(s)	Meeting notes E-mail	Identifying availability and accessibility of required knowledge resources Ep-s evaluation in terms of identifying problem-centred knowledge and, as a consequence, selecting potential participants
	Communication between organisation's leader(s) and potential stakeholder groups	E-mail	Inviting the selected individual to participate in CKC Ep-s evaluation in terms of motivation for participating in CKC
	Documents	Text Network models	Information about the requirements of collaborative environment Ep-s evaluation in terms of its structural requirements Ep-s implementation in terms of its conceptual and physical environment
Knowledge creation	Qualitative text from participants	Qualitative text	key issues related to knowledge domain by the stakeholder group who are affected by the problem Ep-s evaluation in terms of engaging participants in sharing their perception of the problem Ep-s implementation in terms of engaging selected

Table 5-1. The set of data collected during CKC projects in the field

Project stage	Method	Format	Data and its Application
			individuals in knowledge creation
	The relationship between key issues presented by participants and problem domain	Diagrams Tables Text	Display of the key issues related to knowledge domain by the stakeholder groups who are affected by the problem or the ones who have influence on the problem Ep-s evaluation in terms of creating credible problem resolution
	Open-ended interview with available participants	Meeting and discussion notes	Identifying key issues related to problem domain Ep-s implementation in terms of engaging selected individuals and addressing complications of engaging diverse stakeholder groups in CKC
	Discussions between the researcher and available participants	Discussion notes	Validity of qualitative text from customers Ep-s evaluation in terms of issues that influence the communication between individuals Ep-s implementation in terms of engaging individuals in knowledge creation
	The researcher's observation	Field notes	Key issues during group discussions Ep-s evaluation in terms of the need for CKC leader during CKC sessions Ep-s implementation in terms of leader's skill and experience of engaging individuals in knowledge creation
Review and reflect	Communication between participants	Developed solutions (in forms of text and models) Discussion notes	Final improvements and assessments Ep-s evaluation in terms of its effectiveness Ep-s implementation in terms of strengthening knowledge creation process

The analysis of interviews, documents and field notes including discussion and observation were the main research methods employed in this research and he reasons of employing qualitative research strategy of data collection process during the implementation of the multiple case study are clearly described in chapter three. The structure of this qualitative research strategy for the two case studies is illustrated in Figure 5-2.

Some materials have been removed from this thesis due to Third Party Copyright. The unabridged version of the thesis can be viewed at the Lanchester Library, Coventry University.

Figure 5-2. The structure of the multiple case study (adopted from Yin (2014, p. 60))

The remainder of this chapter includes the description of the field research, with emphasis on what data were collected throughout each CKC project. The analysis of the data collected will be carried out in chapter six.

5.2. The implementation of the data collection process

5.2.1. Introduction

In order to support the validation of the new approach to CKC in the field, this section describes the data collection process. This description will start with the collaboration with CMSorg to demonstrate the origin of the first version of Ep-s for the reasons that are as follows:

- It assists the reader to clearly understand how the idea of CKC through indicating and mapping factors affecting a complex problem in a domain and Ep-s as a method originated
- It assists the analysis of the data collected during the collaboration with CMSorg, which will be included in chapter six, for the purpose of verifying findings and assessing the validity of the proposed approach to CKC

The description of the CKC project with CMSorg will be followed by the description of the application of Ep-s during the collaboration with BRS to clarify the sets of data collected and to demonstrate the pattern of Ep-s refinement as a result if of its applications in the field. A summary of this refinement is displayed in Table 5-2.

Table 5-2. The Ep-s refinement as a result of the field research

Ep-s	Origins	Comments
Version 1 **(Practically effective for limited number of stakeholder groups)**	CMSorg project (Privatised and a pure monopoly service organisation)	Clarifying the purpose of CKC with potential service organisations needs to be addressed to eliminate the associated reluctance to share organisational knowledge with researcher(s) Involving the stakeholder groups who are influenced by the problem is an important motive for effective CKC Developing an environment that assists the participant in creating credible problem resolution can eliminate expending time, knowledge resource and effort on what is not required for the completion of CKC CKC leadership has an important role on the effectiveness of problem-solving
Version 2 **(Practically consolidated for engaging number of diverse stakeholder groups)**	BRS project (captive market from different sectors of privatised service industry)	No significant changes to the process were made. However, the following issues were better understood: Impact of organisational support on the result of CKC projects Impact of the problem-related experience CKC leader Positive impact of people-based approaches in comparison with technology based approaches on the result of CKC

A concern emerged as a result of combining evaluation and refinement during the field work: would the data collected throughout the field work be compatible if the CKC method being studied has changed as a result of its applications?

The researcher understood that data collected across the two CKC projects remained valid for the purposes of evaluation on the basis of the degree to which Ep-s was refined during the field work. Although it can be argued that Ep-s was refined, the fundamental process of it remained intact. In other words, the applications of Ep-s in the field allowed the refinement of the method to better implement the same approach to CKC.

5.2.2. A word on leading CKC projects

The strong relationship between the concept of leadership and CKC was considered by the researcher throughout the design and implementation of the multiple case and data collection phase of the research. To address this issue she employed a combination of two approaches that are as follows:

1. In order to succeed in being CKC leader where required by the CKC process, she put extra effort to develop her understanding of the challenges associated with leading collaborations and available resources to address them through conducting intensive literature review on the topic of *leading collaborations* (Findings are presented in this research and in particular in relevant sections such as section 2.3.6, section 2.4.6 and section 4.2)
2. Involving individuals who have expertise in leading collaborations or who could support the process when communicating with stakeholder groups were not feasible for the researcher

The combination of these two approached helped this research to eliminate any negative effect of ineffective leadership on the result of the implementation of Ep-s and the data collected. It supported the researcher to collect the data she knew are essential for the assessment of the new approach and it addressed the limitations of the researcher's skills and experiment as a leader.

5.2.3. The origins of Ep-s: problem-solving at CMSorg

Introduction

The researcher collected the first primary set of data for the assessment and refinement of the new approach to CKC during the collaboration between CU and CMSorg which formed the first CKC project reported in this thesis. The uncertainty about the factors influencing CMSorg problem determined the researcher to consider involving the stakeholder groups who are affected by the problem or who have an influence on the problem in problem-solving and as a consequence, the researcher developed the fundamental dimensions of Ep-s.

The problem at CMSorg

CMSorg, a pure monopoly and privatised service organisation provides an essential service to more than 5,000,000 customers over 10,000 square miles in the UK. It has always been concerned with investing on the development of its infrastructure to continuously improve its operation. However, it was not much concerned with its customers' evaluation of its performance until regulatory bodies introduced penalty mechanism that would be applied to every single customer complaint assigning one point to the *first time complaint*, 100 points to the second time repeated complaint and 1000 points to the third time repeated one. This has been introduced to encourage privatised organisations to consider the customer experience

and in order to collect enough evidence, the regulatory bodies implemented a mechanism to record all customer contacts including the details of complaint and identifying repeat/chase contacts. This put an extra pressure on CMSorg to minimise its customer complaints and also address them quickly. However, the reason of the high level of customer complaint was not clear for CMSorg since it has never reviewed the customer experience with its service. The collaboration between CU and CMSorg took place to investigate and address this issue. This project ran between May 2012 and March 2013 with the aim of engaging different stakeholder groups in identifying root causes of the customer complaints about CMSorg performance. A summary of the key steps of this project is displayed in Table 5-3.

Table 5-3. Key events of CMSorg project and identified dimensions of the new approach to CKC

Part	**Event**	**Later formalised as dimensions of Ep-s**
From May to July 2012	Initial communication between CU research team and CMSorg representatives Reviewing of the aim of collaboration research through revisions of project proposal Discussion of required knowledge resources between the researcher and CMSorg representative from customer relation department Review of documents related to CMSorg problem by the researcher	Project design (project initiation)
August 2012	Discussion between the researcher and CMSorg representative from customer relation department to clarify the availability of knowledge resources Identifying potential participants Initial communication with potential participants Plan the researcher's location within the CMSorg headquarter which would be most feasible for communication between the researcher and knowledge resources	Project design (project preparation)
September and October 2012	Investigating customer's qualitative text to gain a better understanding of their experience with CMSorg Review of literature on the topic of *customer service* by the researcher Review of documents including reports and previous projects related to customer experience available at CMSorg by the researcher	Collaborative knowledge creation (knowledge creation)

Table 5-3. Key events of CMSorg project and identified dimensions of the new approach to CKC

Part	**Event**	**Later formalised as dimensions of Ep-s**
	Open-ended interviews with staff who have knowledge about customer experience with CMSorg Observation of staff interaction with customers Observation of staff training which teaches the agents about how to talk to customers and what customer experience measures they use Identify the different factors influencing customer dissatisfaction Display the relationship between customer complaint and different aspects of service provided by CMSorg	
From November 2012 to March 2013	Present the finding to CMSorg for review and assessment Preparing and presenting project report	Collaborative knowledge creation (review and reflect)

The CMSorg project implementation

From May to July 2012

The opportunity for collaboration was discussed between CU research team and CMSorg representative to identify potential project context and researchers available to conduct the project. This project was not funded and for that reason it was important to select researcher who are willing to contribute to the implementation of the project. For the researcher, conducting empirical research and collecting primary data could have significant value for her PhD research in term of gaining insight and refining her new approach to CKC and therefore, she was ready to contribute and benefit from the outcome of this collaborative project. The exchange of ideas and development of project proposal was discussed through series of meetings at CMSorg headquarter and e-mails between initial CKC team, in particular the researcher and her academic supervisor who was an expert in conducting KET projects, and CMSorg representative who was an expert in addressing issues related to customer experience about this service organisation from Strategy, Customer Insight and Assurance Team. Sample of the data collected at this stage is available in sections of appendix A that are as follows:

CMSorg – Original data collected > project initiation > Summary of the communications between initial members of CKC team

CMSorg – Original data collected > project initiation > Sample of field notes during meetings and discussion

CMSorg – Original data collected > project initiation > Samples of e-mail communications

the experience of CMSorg representative and the researcher and her academic supervisor's area of research has important positive influence on developing most accurate project proposal at this stage. Moreover, the agreement on the content of the project proposal supported clarifying the purpose of CKC which could support effective start of the collaboration. These were identified as two important parts of project initiation during the project design.

August 2012

CMSorg allocated a desk to the researcher in the same area as the Strategy, Customer Insight and Assurance Team at the CMSorg headquarter that she could have active communicate with the team. This supported the researcher to have fast, unscheduled and open-ended interview with the experts from this team. Moreover, she had easy access to observe the communication between the staff and customers of one of the call centre departments from her location. These two opportunities facilitated collecting real and accurate data in a short time.

The researcher and CMSorg representative had a series of meetings to discuss available resources, in addition to experts from the Strategy, Customer Insight and Assurance Team, that could have information or knowledge related to problem domain. The researcher and CMSorg representative also exchanged documentary evidence through e-mails. As a result, a resource that included customer experience with CMSorg services in a qualitative text format and number of experts from customer service departments were selected. These experts were invited to participate and accepted to participate, mostly through telephone conversation between CMSorg representative and them. Only customer service expert from operation department was contacted by e-mail.

Sample of the data collected and inviting experts to participate in CKS at this stage is available in sections of appendix A that are as follows:

> CMSorg – Original data collected > project preparation > Summary of communications about
>
> CMSorg – Original data collected > project preparation > Sample of customer experience with CMSorg in form of qualitative text
>
> CMSorg – Original data collected > project preparation > sample of customer service expert from operation department accepting to participate
>
> CMSorg – Original data collected > project preparation > samples of field notes during meetings and discussion

September and October 2012

In this part of the project, the researcher randomly selected 9,000 specific qualitative comments which included description of customer experience with CMSorg in their own words from their own perspective. Throughout analysing the comments to understand the root causes of customer dissatisfaction with CMSorg, the researcher discussed the matters raised by customers with customer service experts to add to the reliability of the collection of data. In order to do so, the researcher identified the categories of the comments using colour coding at first (a brief sample of the identification of colour codes is shown in Figure 5-3 and a picture of the applied colour coding to the comments, in a minimised scale, is shown in Figure 5-4) and employed further coding to distinguish the comments in each category at second (a sample of comments is used to illustrate this coding method in Table 5-4 and Figure 5-5)

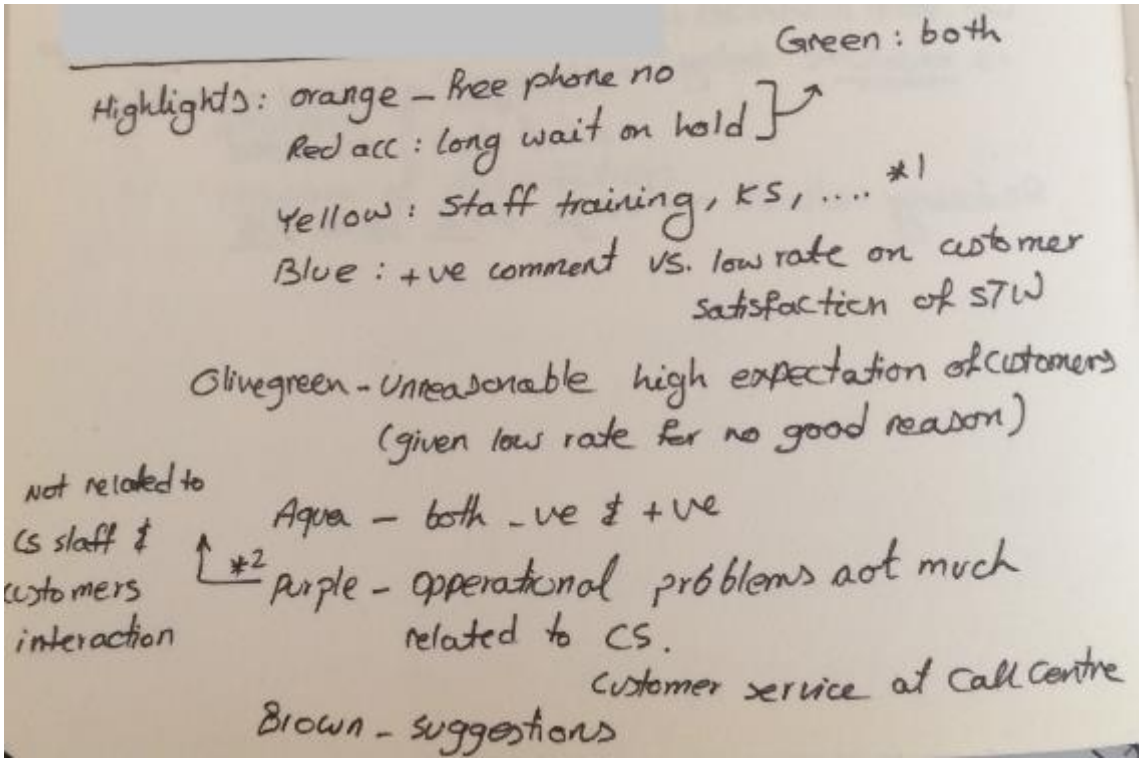


Figure 5-3. Identifying colour codes to categorise qualitative comments of customer

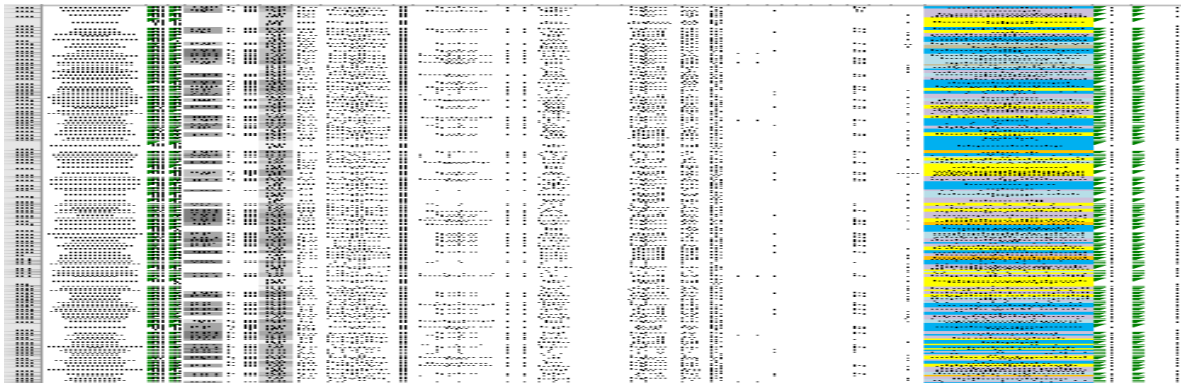


Figure 5-4. Colour coding of qualitative comments of customers

Type of comment	Frequency	Percentage
Compliment (Satisfied)	4241	47.12%
Complaint (Dissatisfied)	4022	44.69%
Neither satisfied nor dissatisfied	562	6.24%
Suggestion	175	1.94%
Total	9000	~100%

Table 5-4. Survey respondents' frequency of comments in each category

Seven comments are selected from different categories to illustrate how the comments are distinguished in each category

because the person i spoke to talk apoligised for keeping me waiting although he hadnt and awas so polite and helpful'

- Compliments > Call Centre > Contacting > Call was answered quickly,
- Compliments > Call Centre > Adviser > Courtesy and politeness of adviser, and
- Compliments > Call Centre > Adviser > Advisor was very helpful

1st person didnot explain that the bill was over 8 monthly payments so i couldnt understand the calculation and thought i had been overcharged .i am a first time buyer so didnt know the payment options .i then had to make a second call to make sense of the payment .the second operator was very good and explained exactly the procedure.

- Complaint > Call Centre > Standard of Advice > Advice/issue was not easy to understand

my problem was not resolved .i was given different information by 2 different advisors .

- Complaint > Call Centre > Standard of Advice > The issue was not resolved to customer's satisfaction, and
- Complaint > Call Centre > Standard of Advice > Contradictory information

your staff should not hang up on customers and should help resolve queries rather than upset customers who need help with resolving a problem .very disappointed'.

- Complaint > Call Centre > Advisor > Lack of willingness to help resolve your issue
- Complaint > Call Centre > Advisor > Adviser did not take customer's question/issue seriously

I 've been told several times there 's [redacted] u 've been out three times to check and everytime the engineers admit there 's a fault yet still I 'm getting told theres two and it got quite annoying even booked un paid time off work for u company .

- Complaints > Excluding Call centre > Communication > Lack of internal communication (between departments)
- Complaints > Excluding Call centre > General > Inaccurate system of storing customers information

you should get chat support !like southern electric doing .it 's very useful and cheap

- Suggestions > Communication > Online customer support

Letter i recd had contact no would have been handy 2 have opening times as well thank u

- Suggestions > Communication > Opening hours along with contact numbers provided in letters

Figure 5-5. Coding to distinguish the comments in each category

These coding actions supported the researcher and experts from Strategy, Customer Insight and Assurance Team to have clear understanding of the importance of the factors identified by the customers and the relationship between the factors and services provided by different parts of CMSorg. The researcher's review of available documentary evidence and her discussions with customer service experts of CMSorg supported the development of insightful knowledge to further code and categorise the areas of customer experience. The customer service experts where from three different departments which have their distinct call centre. The communication with experts from these different call centres supported the verification of the reliability of customer experience, in the form of qualitative text, to be considered in problem-solving. In addition, the researcher had the opportunity to participate in staff training to collect even more data in field to support the verification of the reliability of customer experience. The confirmation e-mail of the researcher involvement in staff training as complete observer and a sample of field notes collected during the training days are included in appendix A in sections that is as follows:

> CMSorg – Original data collected > collaborative knowledge creation > Staff training – Confirmation email and samples of field notes

With using the data collected to this point, number of displays was developed by the researcher. Few of these displays are included in appendix A in section that is as follows:

> CMSorg – Original data collected > collaborative knowledge creation > displays of data collected from CMSorg customers

Further data collection was done through gaining insight from customer service experts to identify knowledge creation barriers within and across internal and external stakeholder groups. The data collected were reviewed during meetings with CMSorg representative and KET research expert from CU to keep the CKC project in the right direction. Description of the data collected during these participants input meetings is included in chapter four, phase two of the new approach to CKC at CMSorg. A summary the participants input meetings is included in appendix A in section that is as follows:

> CMSorg – Original data collected > collaborative knowledge creation > A summary of the participants input meetings

November 2012 to March 2013

During this part of the project the process and findings of the project were documented in project report format and presentation slides. Some communication through e-mail and few review discussions were conducted between the researcher, the KET research expert and the CMSorg representative to include the way that the purpose of this collaboration was addressed and to assess the data collected. A summary of the communication at this stage, samples of data added to the new revisions of the project report are included in appendix A in sections that are as follows:

> CMSorg – Original data collected > Review and reflect > Summary of review and reflect meetings

> CMSorg – Original data collected > Review and reflect > Sample of added text to the CMSorg project report

CMSorg – Original data collected > Review and reflect > Sample of added figures to the CMSorg project report

Final project report and presentation slides were presented to CMSorg at the end of this part of Collaboration between CU and CMSorg. In addition to positive feedback about the value of the new problem-solving approach given to her at the end of the project, CMSorg confirmed the success of the new approach to collaborative knowledge creation in letter format that is included in appendix A in section that is as follows:

CMSorg – Original data collected > Confirmation of the successful application of the proposed new approach to CKC at CMSorg by the CMSorg representative

5.2.4. Industry-wide application of Ep-s: CKC at BRS

Introduction

Dimensions of Ep-s were developed and it was defined as a new structure approach to CKC during the collaboration between CU and CMSorg. The industry-wide application of Ep-s took place through collaboration between CU and one of the major rail industry service organisations, BRS. BRS is owned by rail industry stakeholders and its primary objective is to support the railway performance in terms of improvement in the in health and safety performance of the railways in Great Britain. In order to do so, BRS is intended to lead bodies associated with the Great Britain rail network that are regulatory body, owner and maintainer of rail infrastructure and operators of services on the network.

The problem at the BRS

The nature of the work at BRS demand numerous safety related data and knowledge form diverse organisations within rail industry. The issues related to collecting such data and knowledge are elaborated for some reasons that are as follows:

- Privatised rail industry followed by the breakdown of effective communication between owner and maintainer of rail infrastructure and operators of services on the Great Britain rail network
    - Services and information come from different sources that can be categorised into diverse in content or contradictory and incomplete

  - Domain experts who have safety related experience are geographically distributed
- Owner and maintainer of rail infrastructure is a pure monopoly that creates captive market of operators of services on the Great Britain rail network

In order to improve its quality of work, BRS applies research approach, along with many other approaches, through university-industry collaborations. The funded collaboration with CU was an opportunity for the researcher to implement the new approach to problem-solving that suggested collaborative knowledge creation between organisation within rail industry which are affected by safety related issues and the ones who have influence on the unsafe railway. The new approach to CKC was conducted between June 2013 and April 2014. A summary of the key steps of this project is displayed in Table 5-5.

Table 5-5. Key events of the BRS project

Date	Event
Phase 1. Designing CKC project	
Stage 1. Project initiation	
From June to August 2013	Part one. Developing a clear purpose with CKC team and identify knowledge domain Part two. Engaging the right people in identifying required knowledge resources
Stage 2. Project preparation	
From September to mid-January 2013	Part one. Selecting individuals with problem-centred knowledge for CKC Part two. Inviting the selected individuals to engage in CKC Part three. Planning the conceptual and structural requirements
Phase 2. Collaborative knowledge creation	
Stage 1. Knowledge creation	
23 January 2014	Part one. Clarifying the purpose of CKC with participants Part two. Engaging participants in sharing their perceptions of the problem Part three. Creating credible problem resolution Part four. Engaging the participants in knowledge creation
Stage 2. Review and reflect	
24 January 2014	Review and reflect
From February to April 2014	Preparing and presenting the project report

The BRS project implementation

From June to August 2013

The opportunity for collaboration was discussed between CU research team and BRS representatives to identify potential project context and researchers available to conduct the project. This project could be a good opportunity to collect and analyse all data required to complete the researcher's PhD research as an extension of the lessons learned from her CKC project at CMSorg.

This part of BRS project included drafting the project proposal, the agreement between CU research team and BRS representatives on the project deliverables and creating the initial CKC team that were as follows:

- The researcher
- KET research expert from CU
- Two research and software-design experts from CU
- Two BRS representatives

The results of the communication between CKC team at this stage are included in appendix A in section that is as follows:

> BRS – Original data collected > project initiation > Communication between members of CKC team

From September 2013 to mid-January 2014

This stage of the project included the process of selecting organisations from different stakeholder groups which could contribute to problem-solving and it was followed by identifying and selecting individuals from those organisations who have safety-related knowledge and could contribute to the CKC. In order to involve individuals from different stakeholder groups, whose experiences were essential for the purpose of this part of the project, introducing the CKC project and the members of the research team from CU took place by the BRS representatives who were well-known by those individuals or the organisations. a summary and samples of communication between the members of CKC team and potential participant is included in appendix A in the sections that are as follows:

BRS – Original data collected > Project preparation > Summary of communications between members of CKC team and potential participants

BRS – Original data collected > Project preparation > Samples of methods employed by the researcher to use mass data from documentary evidence

BRS – Original data collected > Project preparation > Sample of notes from telephone conversations between members of research team from CU and selected participants

BRS – Original data collected > Project preparation > Samples of communication between members of research team from CU and selected participants through e-mail

Once enough data about potential contribution of selected participants and their willingness to engage in knowledge creation were collected, the CKC team members from CU planned the two-day design-shop and invited the selected participants to engage in collaborative knowledge creation. The details of invite letter, confirmation emails and the design-shop agenda are included in appendix A in section that is as follows:

BRS – Original data collected > project preparation > Design-shop invite letter, confirmation emails and design-shop agenda

23 January 2014

CKC meetings in form intensive two-day design-shop were divided into CK meetings which took place on the first day and review and reflect meetings which took place on the second day. The first day of the design-shop was designed to assist engaging diverse individuals in knowledge creation. Detailed description of the four parts of this stage is included in chapter four. The field notes collected during this part of the design-shop before applying codes which contains the researcher's observation, discussion with experts and problem-related notes and samples of collaborative mapping of the factors with negative impact on railway safety are included in appendix A in sections that are as follows:

BRS – Original data collected > Knowledge creation > Samples of notes from the design-shop

> BRS – Original data collected > Knowledge creation > Collaborative mapping of the factors with negative impact on railway safety

24 January 2014

After the end of first day of CKC meetings, the researcher and KET research expert developed displays of safety-related issues in form of data models which were identified by the participants to reduce the time that would be required for this task during the review and reflect meetings. A sample of these data models is included in appendix A in section that is as follows:

> BRS – Original data collected > Review and reflect > Samples of data model as outline by expert

These data models were reviewed by the participant during this part of CKC meetings. This part of the CKC meetings assisted the participants to review their discussions and inputs during the first day of the design-shop and it prepared the participant to reflect on their specific findings. A sample of the data models revised by participants is included in chapter four (Figure 4-20).

From February to April 2014

The research team from CU prepared and presented the project report that included the process and outcomes of the CKC project to BRS. This part of the project had no influence on the process of implementing Ep-s.

<u>How version 2 of Ep-s was consolidated at BRS</u>

Version 2 of Ep-s did not change significantly as a result of its implementation at BRS. However, this project provided an opportunity for learning in different areas of this approach. These areas are described in this section

Project Initiation

Industry-wide collaborative leader. The number of organisations required to participate in the implementation of Ep-s at BRS increased significantly and it was important to consider the feasibility of involving collaborative leader(s) who are known by those organisations within the rail industry. The senior managers from BRS addressed this issue which assisted

the process of identifying, selecting and engaging many organisations from diverse stakeholder groups during the application of Ep-s to CKC.

Management support. The implementation of Ep-s at BRS had full support from the senior managers of all the participating organisations.

Project preparation

CKC meetings. It became evident that the CKC meetings that could facilitate face-to-face meetings between all the specified participants at one time and location would significantly reduce the amount of time required from individual participants to contribute and reduce the amount of time and effort required from the CKC leader(s) to capture, disseminate problem-centred knowledge of the participants. It also could contribute to the effectiveness of problem-solving activities.

Collaborative knowledge creation meetings

Duration of the meetings: The length of the CKC meetings were significantly different in the BRS project, with the CKC participants spending two full days of collaborative mapping, reviewing and improving data models

Visual mapping: The application of Ep-s to CKC benefited from engaging all the participants, simultaneously, in developing extensive visual mapping of the factors influencing the problem.

Leadership: While the researcher added the experience of the approach being used, the BRS leader had the experience of the subject being discussed.

The key lessons learnt from the application of Ep-s at BRS are summarised in Table 5-6.

Table 5-6. Key lessons learnt from the application of Ep-s (version 2) at BRS

Ep-s stage	Key issues
Project initiation	Collaborative leader(s) can have an important role in identifying and selecting diverse stakeholder groups during CKC process. collaborative leaders can also ease the communication between diverse stakeholder groups.
Project preparation	Particular importance of people-based approaches for creating conceptual environment when effective problem-solving requires collaboration between varying number of diverse stakeholder groups
Collaborative knowledge creation	The number of meetings and the duration of the meetings are determined by the perception of the CKC team or the practicalities of their implementation. Version 2 of Ep-s is flexible enough to allow as many meetings as the team considers necessary It was observed that version 2 of Ep-s is not dependent on the researcher acting as a CKC leader. Different collaborative leader(s) could add their own perspective to the approach if they are fully committed to achieving best results. Also, the approach worked with leader(s) from different professions.

After applying the new approach to CKC in two different service industries, the collaboration with BRS suggested that version 2 of Ep-s was stable and that it also worked industry-wide

At this stage, the researcher considered that enough data had been collected and that it was appropriate to conduct the cross-case analysis of those data. No more field work was strictly required to the aims of addressing the research questions that had driven the data collection process.

5.3. Summary of data collection process

The new approach to CKC has been validated and refined after its initial design and development at CMSorg which was followed by its application at BRS during which twelve senior managers from nine organisations of diverse stakeholder groups participated in the research reported in this chapter.

A number of factors that inspired the data collection process are as follows:

- The primary research question that leads this research
- The set of additional research questions that are described in chapter one
- A conceptual framework that illustrated the key concepts to be studied and the relationship between them that is presented in Figure 5-1.

The structure of the data set collected during the implementation of each of the KET exercises in the field is presented in Table 5-1. A section of the actual data collected is available in appendix A. Constrained by the need to protect the confidentiality of the individuals and the organisations involved the data in appendix A includes at least references to:

- Significant amount of notes taken as a result of direct observation
- Presentations of the outcomes of the CKC projects
- A significant number of documentary evidence reviewed in all the organisations involved
- A large number of e-mails sent to and received from individual participants during the CKC projects

During the application of Ep-s in the field, assessment and refinement of the method have been successfully included. Thus, the field work has produced a reliable approach to CKC in service industries and the data that would enable its evaluation.

As described in section 5.2.1, the researcher was aware of the fact that combining Ep-s assessment with its refinement may have affected the conclusions that could be drawn from the data collected. However, the value of the contribution to the body of knowledge in the KM field provided by this approach to conducting the field work outperforms the limitations it imposes to the evaluation of the method.

The following chapter will describe the analysis of the data collected.

CHAPTER SIX

6. ASSESSMENT OF THE NEW APPROACH TO COLLABORATIVE KNOWLEDGE CREATION

A new approach to collaborative knowledge creation has been developed in order to address the set of research problems identified during early stages of this research. The descriptions of the elements of this new approach and data collection and analysis during the development and implementation of it have been included in previous chapters.

This chapter describes how these data were processed, condensed and presented for the drawing and verification of conclusions that address the research problems.

6.1. The analytic method employed by this research

6.1.1. Complexity of the data analysis

The previous chapter presented that a large amount of data was collected during the application of a multiple case study. This chapter will describe the methods that the researched employed to use these data in order to evaluate Ep-s.

Ormston *et al.* (2014) remarks that the nature of qualitative data collected in this research suggests that an interpretive approach would be required for analysing these qualitative data. Therefore, in this research interpretive approach employed interpretive approach to analyse the primary qualitative data which had been collected mainly through observation, open-ended interviews and e-mail communication.

Spencer *et al.* (2014) specify that the term *data management* refers to the process of making qualitative data *manageable* which is essentially required for sorting mass of data. Miles *et al.* (2014) remarks that data management covers what to store, retrieve from and retain. Qualitative data collected during this research is a resource of rich description and explanation from several resources within two case studies and for these reasons data

management was very important for the researcher. Lewis *et al.* remark that transferability or generalisation of qualitative research from the context of the research to other settings or contexts adds to the challenges associated with qualitative research (2014).

In this research, providing evidence of the applicability of the new approach to CKC in other service organisations and by other individuals different from the researcher who implemented, assessed and refined it in the field was another challenge of qualitative data for the researcher. In addition to the challenges associated with qualitative data analysis, case study data analysis is especially difficult. Yin explains that the difficulties of analysing data collected through case study is based on lack of feasible techniques to carry out such analysis (2014). Another challenge associate with qualitative data analysis is the impact of researcher's conceptual thinking on the employed process of data analysis is more significant than the employed methods.

Regardless of different perspectives of authors, referred to in this research, on the benefits, limitations and difficulties of qualitative research, they (Bryman and Bell, 2015; Miles *et al.* 2014, Ormston *et al.* 2014; Silverman 2013 and Spencer *et al.* 2014) agree on the importance of trying to achieve two key objectives while carrying out qualitative data analysis that are as follows:

1. Focusing on the high-quality accessible data and documentation of just the analyses that have been carried out
2. Transforming the data into something meaningful for the research and its audience

6.1.2. Outline of the analytical process employed by this research

In order to achieve the two key objectives of qualitative data analysis in case study research, this research followed a combination of analytic process suggested by case study research guide of Yin (2014) and analytic process suggested by most popular authors in the area of qualitative data analysis that are Bryman and Bell (2015), Miles *et al.* (2014) and Silverman (2013). This analytical process comprises three elements that are as follows:

1. Identifying evidence to address research question(s)
2. Employing the most reliable evidence to draw a conclusion
3. Clearly presenting the evidence to support the validity of the conclusion

This research follows Miles *et al.* (2014) three streams of analysis activity to present the principles employed to address these elements of the analytical processes of qualitative analysis. The three streams are as follows:

1. Data condensation

Data condensation, type of the coding of data, is a part and form of analysis that presents researchers' analytic choices of refining, arranging, focusing, discarding and organising data. Some authors refer to the process of selecting, focusing, simplifying, abstracting and/or transforming the data collected through field notes, interview transcripts, documents and other empirical materials as *data reduction* process which is essential for dealing with mass of data. Miles *et al.* (2014) refer to this process as *data condensation*. They explain that this term presents the effort of researcher(s) on making the data stronger while the term *data reduction* might be understood as weakening or losing something during the process.

The primary set of qualitative data collected during each application of Ep-s in the two case studies included data relevant to the purpose of implementing the CKC projects and also relevant data required for evaluating Ep-s. The next step was to select the data set and transform every piece of field notes and transcription of open-ended interviews and other empirical material that was relevant for the evaluation of Ep-s into text in compact forms.

2. Data display (Matrix)

Miles *et al.* (2014) refer to data display as matrix which, similar to data condensation, is part and key flow of analysis activity. They explain that this analytical activity assists researchers in conclusion drawing and action through supporting them in presenting an organised and compressed assembly of mass qualitative data which can be in the form of conceptual framework and network displays to show the interrelationship between variables or table displays that helps the researcher to decide on the rows and columns and the type and form of data to be included in each cell. This part of analysis is particularly essential for supporting the researcher in organising *extended filed notes* into immediately accessible and compact form.

Tables, conceptual frameworks and network models are employed in this research to display the most important aspects of the collected date study qualitative data which assist the readers in conclusion drawing through understanding the factors influencing the process of implementation of each CKC project in the multiple case studies.

3. Conclusion drawing/verifying

Miles *et al.* (2014) emphasise that it is important for qualitative researchers to pay particular attention to maintain openness in the early stages of noting patterns, explanations, causal flows and propositions. They explain that the initial inexplicit conclusions assist researchers to create correspondence between final conclusions and size of field notes, the coding, storage and retrieval methods employed in the research. Moreover, they emphasise that conclusions are also *verified* as the primary research proceeds. Conclusion verification illustrates the validity of the findings to confirm the conclusions through revisiting the data collected.

In this research, the results of the analysis of data collected from the application of Ep-s within each CKC project were used to generate theoretical constructs. These theoretical constructs were then grouped into conclusions.

The relationship of these three streams – types of analysis activity – and the activity of data collection itself is shown in Figure 6-1.

Some materials have been removed from this thesis due to Third Party Copyright. The unabridged version of the thesis can be viewed at the Lanchester Library, Coventry University.

Figure 6-1. Components of data analysis: Interactive model (Miles and Huberman, 1994: p-12)

6.1.3. Quality of findings and conclusions derived from analytical approach to data analysis

In order to address the critical need for clarifying the validity of findings of this research to show that it is rigorous and competent, this section of the thesis addresses the challenges associated with testing or confirming the findings and validating the quality of conclusions.

Tactics for confirming findings

Checking for researcher and participants bias

1) Researcher bias

Eisenhardt (1989) emphasises that in addition to being affected by more powerful participants, insufficient data and disconfirming evidence followed by irrational conclusions is the result of researcher bias in data collection and analysis. Miles *et al.* (2014) remarks there are two possible source of researcher bias that are as follows:

1. The effect of the researcher on the case (during the field study)
    - Unknown position of the researcher for other people in the environment where the research is taking place. Individuals will perceive the researcher as an outsider which has negative impact on the accuracy of data collected)
    - Unknown purpose of researcher's presence for other people. individuals will be less honest the information they might share with the researcher or they might change the way they work other times)
    - Unknown purpose of the research. Individuals might not participate in information or transfer when they do not know what might be done with their experience or information being collected)

To address these biases, the researcher made every effort to employ approaches that could help her in avoiding these biases. These are as follows:

- The researcher made sure that she is introduced to participants and her role is described either by the organisation representative or CKC leader prior to any CKC related activity including open-ended interviews, meetings or observation process. In the absence of this opportunity, the researcher dedicated some time to introduce herself and describe her role at the beginning of any of these processes.
- Clearing the purpose of CKC had its specific part throughout implementation of the new approach and because of its significant impact on the effectiveness of CKC process, every effort was made by the researcher that clearing the purpose was neither neglected nor omitted.
- The researcher planned to conduct informal discussions with participants in a social, experimental and systemic environment for effective CKC.

2. The effect of the case on the researcher

Biases originated by the effect of the researcher on the case increase the occurrence of the bias caused by the effect of the case on the researcher. To address these biases, the researcher planned to employ techniques that could help her in avoiding these biases in this research. These are as follows:

- The researcher needed to investigate different stakeholder groups' perspective as the method of investigating divergent data collection and analysis to address this type of researcher bias. Therefore, this research explored stakeholders' needs and expectations within each group of stakeholder in line with their perspective and expectations from each another.
- Keep thinking conceptually; translate sentimental or interpersonal thoughts into more theoretical ones. This technique helped spanning some knowledge boundaries to add to the effectiveness of CKC
- In case of sensing being misled, the researcher reviewed available evidence and discussed the matter with experts to assure reliable data were collected
- Triangulate with several data collection methods
- This research needed the participants to share their problem-centred knowledge without being concerned about any negative impact of it on themselves or their organisations. Therefore, building mutual trust between participant and the researcher and between participants themselves was one of the key actions during the conduct of this research.

2) Participant bias

Eisenhardt and Graebner (2007) emphasise that the researcher has to value the participants' different perspectives in addition to understanding the importance of different perspectives on the effectiveness of collaboration. This helps the researcher to reduce participant bias and turn it into the elements of better understanding the factors that influence the development of boundaries between individuals and different groups of stakeholders. The new approach to collaboration developed in this research facilitated an environment within which the stakeholders had the opportunity to express their perspective. It supported the better understanding of the interconnectedness of different factors that develop the problem affecting the domain that resulted in creating credible problem resolution.

The pressure on participants who feel that their perspective and experience has no value for the other participants and they need to express only what others accept as reasonable affects participant bias. Brown *et al.* (2004) affirms that one of the potential factors that create bias is the power difference between the participants and the researcher. In the case of this research, it was very important for the researcher and purpose of her collaboration with service organisations to provide an effective collaborative environment that addresses the issues related to power differences through building mutual approval that all the participants agree on the benefits of their contribution to CKC for their organisations.

Triangulating

Triangulation, a near-obligatory method of confirming findings of qualitative research (Miles *et al.*, 2014), is one of the key components of case study research (Denscombe 2007; Yin 2014). The importance of triangulation in interpretive paradigm revolves around investigating the extent to which different sources of data support the researcher to understanding the aim of the research.

The importance of interpretive paradigm lies in the researcher's intent to bring understanding about the aim of the research and the extent to which any one source of data adds to that understanding or clarifies between conflicting meanings. This research maintains triangulation to gain maximum possible understanding from multiple perspectives.

Triangulation of data is the method of collecting evidence from multiple data sources and methods. Miles *et al.* (2014) affirms that qualitative researchers are always faced with triangulating data either intentionally or unintentionally. Triangulation can be described by *data source*, by *theory*, by *method* and by *theory* (Denzin, 2001; Denzin and Lincoln, 2017) or *data type* (Miles *et al.* 2014). Data sources in this research included individuals from different stakeholder groups and the collaboration's structural environment varied during the implementation of Ep-s in the two case studies. The researcher employed different methods such as CMSorg' customers' problem-centred knowledge in the form of qualitative text, transcription of observations, filed notes and open-ended interviews. The researcher was aware that triangulation can add to the complexity of data analysis and to prevent this, she focused on qualitative analysis rather than combination of qualitative and quantitative analysis.

Tactics for confirming quality of conclusions

To address the challenges associated with epistemological perspective that focus on the ways of fitting research findings into what is accepted body of knowledge, this research focused on the more practical *critical realist tradition* perspective of Miles *et al*. (2014) which pairs traditional terms of *naturalistic* perspective of Lincoln and Guba (1985) with more viable alternatives for assessing the reliability and validity of naturalistic research. Therefore, the five key, somewhat overlapping, issues related to standards for quality of conclusions employed in this research are as follows:

Objectivity/confirmability

The research conclusions need to be reasonably devoid of unacknowledged researcher biases and explicit about inevitable biases that exist. Tactics employed by the researcher in consideration of this issue are as follows:

- She included explicit and detailed description of the employed methods and procedures for data collection and analysis of each CKC project in the body of this thesis, including appendixes, to present all the required information to provide a complete picture for drawing conclusions
- She presented a clear sequence of how data were collected during each CKC project, processed, condensed or transformed and displayed to assist specific conclusion drawing
- She was aware of the issues related to personal biases and described how she addressed them during CKC projects the beginning of this section (Checking for researcher and participants bias)
- In addition to the available actual data collected in the body of this thesis, some of the data collected are condensed or transformed for the purpose of this research and some data (e.g. actual identification of resources, including individuals and organisations) has been altered to maintain confidentiality and anonymity throughout this thesis. However, the researcher retained all the actual data collected and they will remain available for reanalysis by others where required and agreement with participants is maintained.

Reliability/Dependability/Auditability

Consistency of the process of the study demonstrates reliability of the qualitative research. The factors considered by the researcher about the issues of quality and reliability of conclusions are as follows:

1. She included a clear research questions and worthy relationship between the research questions and research design, in this research. Moreover, the concept of research problem is clearly specified in the primary and secondary research questions and the reasons for the chosen research design to address the research questions is discussed in detail.
2. The researcher's role and status within the case studies are explicitly described in the relevant chapters of this thesis.
3. The findings show meaningful parallelism across data sources, in this research, and all the data collected and the reports written were organised according to its contexts, which was identified by the relevant case, type of event, dates, people involved and stages of CKC process related to each document produced.
4. Research paradigms and analytical constructs are clearly specified in section 3.3.
5. The process of data collection addressed the required data suggested by the research questions including range of appropriate knowledge sources and knowledge creation settings.
6. Data quality checks have been made (e.g. for bias, deceit – this is described in detail at the beginning of this section, under Checking for researcher and participants bias, and 3.5section 3.5. Ethical issues)

Internal validity/Credibility/Authenticity

In order to address the credibility of the research, it was essential that the researcher had an *authentic portrait* of what she was studying and assist the research participants and readers in finding meaning and coherent in conclusions of the research. The factors supporting this issue are as follows:

- This case study research revolved around scholarly questions that merits this research

- In this research, the problems associated with engaging diverse stakeholder groups in effective knowledge creation are investigated and addressed through

triangulation which supported the use of different sources of data and findings within this research that allowed better understanding of the CKC process

- The description of the research design and methodology in this thesis assists the reader to determine the research quality
- There is significant evidence that the data was collected by applying the process for CKC defined in chapter four of this thesis.
- The thesis included the negative evidence identified throughout the development and implementation of Ep-s and described that either they resulted in refinement of the method or identifying factors influencing characteristics of it.
- This research involved the original participants in CKC projects in describing the accuracy of the conclusions

External validity/Transferability/Fittingness or Generalisation

The degree of which the findings of the qualitative research can be of relevance beyond the sample and context of the research itself is a critical challenge in particular for case study approach. In order to illustrate the transferability of this research, the researcher considered useful points that are as follows:

- Although identities organisations or stakeholder groups involved in the multiple-case study have not been revealed in this thesis, their characteristics have been described to an extent where a reasonable understanding of the reported CKC is possible.
- This research involved diverse sample of service organisations and stakeholder groups in CKC projects. As a consequence, in the application of Ep-s different type of problem related knowledge have been considered. This empirical evidence from multiple-case study suggests that the application of Ep-s is likely to achieve reasonable levels of success in other organisations within sectors that at least include the ones represented in the multiple-case study.
- Throughout this research, the findings were presented at conferences for discussions and peer feedback (The details of the conferences is available in appendix C)

Utilisation/application/action orientation

In order to demonstrate the value of conclusions for the participants and potential users, including individuals and organisations, of this researcher, the researcher employed some useful points that are as follows:

- Ethical concerns are described explicitly in this thesis. This is included in section 3.5.
- The findings of this research has been intellectually and physically accessible to its potential users
- The action taken by this research has been beneficial for:
    - The involved service organisations in terms of sharing problem-centred knowledge to solve complex problems
    - For the researcher in terms of developing new approach to CKC and collecting enough evidence to validate the findings towards completion of her PhD research
- The definition of the new approach to CKC has been included in chapter four and it has been explicitly documented as a result of this research to assist its application by potential users.

6.2. The process of condensing the data collected

6.2.1. Introduction

Data collected during the field research were in different forms including field notes, e-mails exchanged between the participants, notes from open-ended interviews, CKC meetings, and design-shop sessions that involved individuals from the organisations engaged in the multiple-case study.

The researcher recorded most of the field notes that she collected throughout this research, in notebooks. These field notes contain valuable pieces of data collected during the field research that summarises important ideas that were essential for running CKC. The sections of the notes which include many codes that lead to clearing the relationship between different filed notes are mostly understandable only by the researcher. The samples of these field notes in

Figure 6-2 presents the factors discussed in the course of a meeting at CMSorg headquarter and additional codes that were added by the researcher during other stages of the project. The researcher deleted few parts of the notes presented here to respect confidentiality and anonymity.

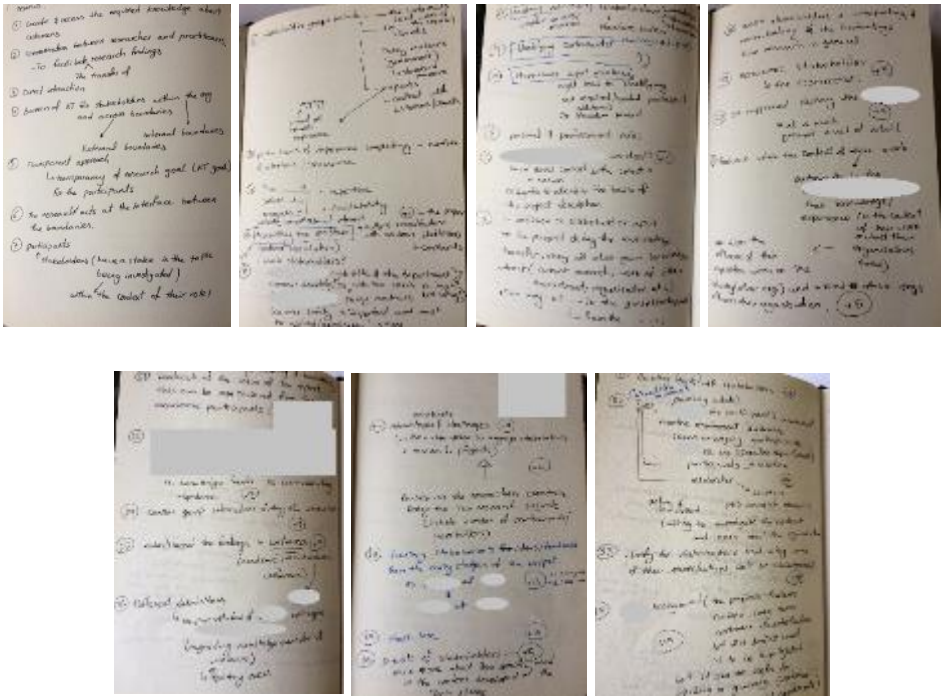


Figure 6-2. Samples of the data collected in the form of the researcher's notes

The researcher also collected various numbers of e-mails over the course of field research. In addition to valuable data for running CKC projects, these emails contained explanations of very specific problem-related data such as specifications of software used at CMSorg call centre or specifications of safety related information architecture at rail industry which were only valuable for the participants form the involved stakeholder groups. Therefore, most of the details included in the e-mails by the participants provided significant input to the problem-related data set to be analysed during the CKC meetings and did not provide a significant input for the purpose of assessing the validity of the new approach to CKC. Moreover, some of those e-mails contained information that was only relevant at the time that they were sent or received, e.g. those e-mails related to times and venues of CKC sessions. Therefore, it was essential for the researcher to significantly reduce the data collected through e-mails.

Spencer *et al.* (2014) clarify that essential part of analytic process of investigating qualitative data is to reduce the original data from their raw form of documentary evidence, observation

notes, verbatim text and any other data in order to enable the researcher to make sense of the evidence. However, as they emphasise, the process of reducing data should not affect the meaning of original terms, thoughts and view of the study participants. Therefore, it is important to partly capture synthesis in a way that leads to recognising the original material. Miles *et* al (2014) refer to this process as coding which is a *data condensation* task for the reason that codes are *prompts* for deeper reflection on the data's meanings. Therefore coding enables the researcher in terms of decisions such as which data chunks to code and which to pull out, which patterns best summarise a number of chunks and which story to tell as described in section 6.1.2. To achieve the aim of condensing the data collected, the researcher employed two key steps that are as follows:

1. Coding the data

   This step included meaningfully dividing sets of collected data after reviewing the field notes while maintaining the relation between the data sets through two stages of coding that are as follows:

   - Summarising segments of data by assigning units of meaning to the data collected using tags or labels. Saldaña (2015) refers to this stage as first cycle coding methods that are codes initially assigned to the data chunks
   - Grouping those summaries into a smaller number of categories, themes or constructs by looking for patterns (Miles *et al.*, 2014). Saldaña (2015) refers to this stage as second cycle coding methods that pull together a lot of material from first cycle coding. Miles *et al* (2014) refer to the second cycle coding as pattern coding.

2. Developing theories based on the identified patterns

   A theory in this research is considered to be *a description of the pattern that the researcher finds in the data* (Auerbach and Silverstein, 2003, p. 31). The researcher focused on developing theories that were relevant for the factors that drove the data collection which are outlined in section 6.1.1.

The remainder of this section revolves around describing each of the steps followed during the analysis of the data collected during the implementation of the multiple-case study.

6.2.2. First cycle codes and coding

Coding is a method that allows the use of words to assign meaning to a piece or chunk of data which could be in a form of a phrase, sentence or a paragraph (Bryman and Bell, 2015; Miles *et al*. 2014; Myers 2013; Silverman 2013). Following the Lichtman's description of initial coding (2014, p.329) and Miles *et al.* definition of *provisional coding* which is an explanatory coding method that is appropriate for qualitative research that build on or confirm previous research or investigation (2014, pp. 77-78), the researcher understood coding as the process of grouping words together into conceptual groups that represents ideas which can be related to at least one of the three categories that are as follows:

1. The research hypothesis
2. The research questions and related conceptual framework
3. The literature review that outlines the limitations of existing approaches to CKC

Table 6-1 presents the list of the researcher-generated codes used in this research and table presents the definitions of the codes.

Table 6-1. The list of codes used in this research

Category/Code	**Code**	**Source**
Category: Limitations of existing approaches to CKC	**LIM**	Literature review, primary research question, hypothesis and conceptual framework
LIM: Demands	LIM-D	Literature review, primary research question, hypothesis and conceptual framework
LIM: Stakeholder boundaries	LIM-SB	Literature review, primary research question, hypothesis and conceptual framework
LIM: Knowledge boundaries	LIM-KB	Literature review, primary research question, hypothesis and conceptual framework
LIM: Motivation	LIM-M	Literature review, primary research question, hypothesis and conceptual framework
LIM: Problem-centred knowledge	LIM-K&E	Literature review, primary research question, hypothesis and conceptual framework
LIM: Collaborative leader	LIM-CL	Literature review, primary research question, hypothesis and conceptual framework
LIM: Problem solving	LIM-PS	Literature review, primary research question, hypothesis and conceptual framework
Category: Group dynamics	**GD**	Literature review, RQ3, hypothesis and conceptual framework
GD: Trust	GD-T	Literature review, RQ3, hypothesis and conceptual framework
GD: Communication	GD-Com	Literature review, RQ3, hypothesis and conceptual framework
GD: Leadership	GD-Lead	Literature review, RQ3, hypothesis and conceptual framework
Category: The new approach to CKC	**NCKC**	Literature review, hypothesis and conceptual framework
NCKC: Participants	NCKC-P	Literature review, RQ1, hypothesis and conceptual framework
NCKC: Conceptual environment	NCKC-CE	Literature review, RQ2, hypothesis and conceptual framework
NCKC: Technology	NCKC-T	Literature review, RQ4, hypothesis and conceptual framework
NCKC: Problem-solving	NCKC-PS	Literature review, RQ2, hypothesis and conceptual framework
NCKC: Outcomes	NCKC-O	Primary research question, hypothesis and conceptual framework
Category: Evaluation of CKC success	**EVAL**	Literature review, RQ5, hypothesis and conceptual framework

Table 6-2 includes the definitions of the researcher-generated codes presented in Table 6-1.

Table 6-2. Definition of the codes used in the data analysis

Code	Definition of data
Codes related to the limitations of existing approaches to CKC (LIM). The selected codes in this category are used to group issues that challenge the success of existing approaches to CKC in the relevant literature that could lead to the development of the new approach to CKC	
LIM-D	The data that are relevant to understanding the effects that the demand of the application of the new approach might have on the success of CKC
LIM-SB	The data that are relevant to understanding the impact of stakeholder boundaries on the success of CKC projects
LIM-KB	The data that are relevant to understanding the impact of diverse perceptions of CKC participants on understanding and discussing the aim of CKC
LIM-M	The data that clarify the relationship between participants willingness to participate in CKC and contribute to its success
LIM-K&E	The data that identify the role of skill, knowledge, experience and expertise on the effectiveness of CKC
LIM: CL	The data that explain the extent to which skilful leader(s) can improve the process of CKC
LIM-PS	The data that assist the researcher to distinguish CKC applied to solve problems from the ones employed for pure learning
Codes related to group dynamics (GD). The selected codes in this category are used to group issues that show the extent to which Ep-s considers the lessons learned from the field of group dynamics in an attempt to achieve better results in terms of CKC.	
GD-T	The data that include the relationship between trust among CKC participants and success of Ep-s to CKC
GD-Com	The data that identifies the relationship between process of communication of ideas and knowledge where contributions are not restricted to specific group members can take place during the implementation of Ep-s
GD-Lead	The data that identifies the relationship between CKC leader's problem-related knowledge and effective problem-solving
Codes related to the new approach to CKC (NCKC). The selected codes in this category are used to group issues that are relevant to describing the extent to which specific characteristics of the new approach can contribute to making it a successful approach to CKC	
NCKC-P	The data that explain the relationship between the success of CKC and proposed method of identifying, selecting and engaging participants who will be involved in the CKC process
NCKC-CE	The data that can assess the value of creating conceptual environment for the success of CKC meetings
NCKC-T	The data that can assess the role of communication technologies in the CKC process when Ep-s is applied
NCKC-PS	The data that are required to assess the effectiveness of knowledge created at CKC projects
NCKC-O	The data that include the outcomes brought to the organisations and the individuals involved by applying the Ep-s for running a CKC project
EVAL	The data that assist evaluating the process of CKC, based on the experience of applying Ep-s

Once the list of codes was developed, the researcher analysed all the data collected such as field notes, e-mail communications, notes from open-ended interviews, observation and notes from CKC meetings. For every relevant piece of data, the codes described in Table 6-2 were embedded in the original text. Samples of identifying relevant text within a section of CKC meeting is shown in Figure 6-3.

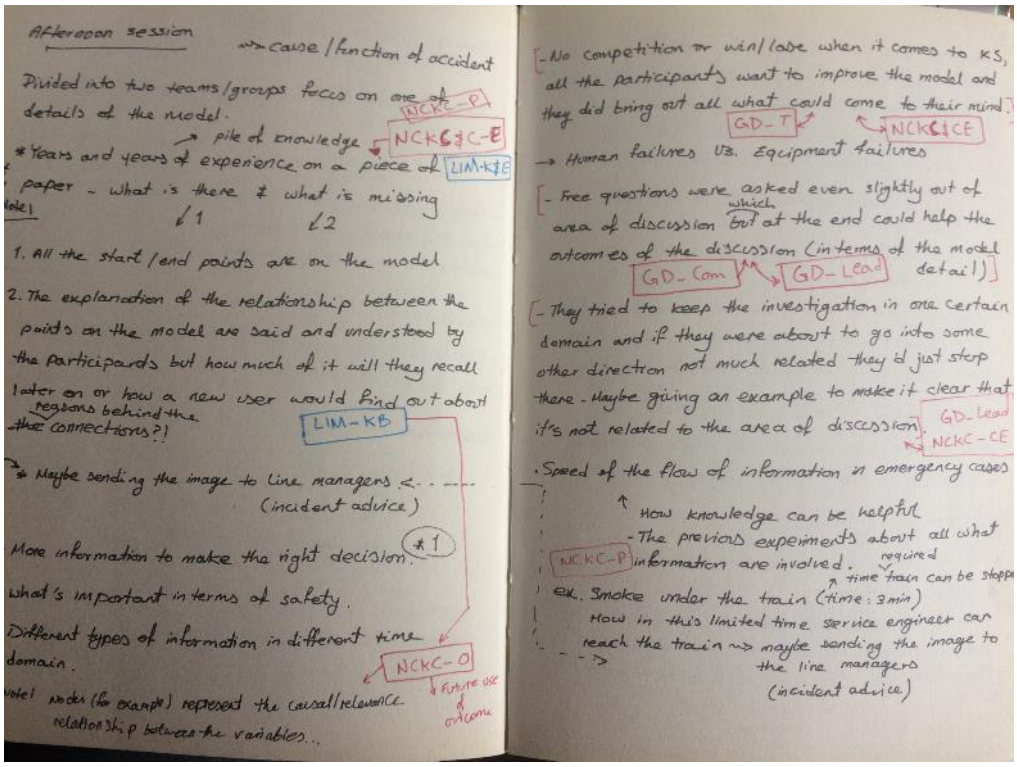


Figure 6-3. Samples of assigning codes to identified relevant data from CKC meeting

The data condensing and transforming process assisted the development of pattern codes that are the focus of the next stage of the process presented in this chapter.

6.2.3. Second cycle coding: Pattern codes

The first cycle coding, described in section 6.2.2 assisted the researcher to summarise segments of data from specific documents which were produced during the data collection process. in order to create smaller number of ideas or themes to represent the perception of more than one individual, it was essential to group the results of first cycle codes. Miles *et al.* (2014) refers to this process as pattern coding which helps qualitative researchers to identify an emergent theme through pulling together a lot of material from first cycle coding into more meaningful units of analysis. Auerbach and Silverstein (2003) refers to theme as an implicit topic that organises a group of repeating ideas.

In order to identify pattern codes, the researcher condensed the data that resulted from the first level coding using a smaller number of concepts that could be mentally stored and readily retrieved. These concepts, which synthesise the sets of concepts that were originally defined in Table 6-1 and Table 6-2 during the first cycle coding, are included in Table 6-3.

Table 6-3. The concepts that were employed during the second cycle coding of data collected throughout the multiple case study

Code	Definition of code	Definition of data
I. Ep-s approach	The implementation of CKC based on collaborative problem-solving	Group of data that assist this research to investigate whether the Ep-s approach as defined in chapter four of this thesis is successful in effectively engaging diverse stakeholder groups in CKC
II. Other approaches	The limitations of existing approaches to CKC in comparison with the application of Ep-s	Group of data that assists this research to understand the extent to which Ep-s reduces the limitations of other approaches to CKC
III. Group dynamics	Ep-s and leading group dynamics	Group of data that assists this research to understand the extent to which the success of Ep-s in effectively identifying and engaging individuals from diverse stakeholder groups in solving complex problems is related to the nature of the CKC team and the leadership of its group dynamics.
IV. Evaluation	Evaluation of Ep-s as an approach to CKC	Group of data that assists this research to understand how the application of Ep-s was evaluated and whether such an approach to evaluation was successful

Data condensation in the second cycle coding assisted this research in grouping the frequent facts in the process of the implementation of Ep-s in different service industries, or frequent phrases in field notes, open-ended interviews, e-mails and other data that had been coded through first cycle coding. These repeating themes were extracted from the data collected and presented in a number of tables.

The researcher employed presentation of the data in table format to address the limitations of purely text-based evidence. Moreover, presentation of the data in table format allows focused display that will permit simultaneous viewing of a full data set derived from multiple case study. This method assisted the researcher to draw conclusions that answer the research question and it is intended to assist the reader to clearly understands the origin of such conclusions. The use of tables is supported by the researcher's experience in using different

visual representation schemes as an aid to conveying knowledge that could otherwise be difficult to understand.

The second cycle analysis of data collected during the application of Ep-s at CMSorg is included in Table 6-4. A similar analysis for data collected during the application of Ep-s at BRS is included in appendix B.

Table 6-4. Key ideas and themes from the CKC project at CMSorg

<table>
<tr><td colspan="2">I. Ep-s approach. The implementation of CKC based on collaborative problem-solving</td></tr>
<tr><td>A. Outcomes of the application of Ep-s</td><td>The outcomes that were identified by individuals can be grouped into four key categories that are as follows:
1. Learning by experts
The role of the experts who participated in the project was to contribute their relevant knowledge. However, they felt that they benefited from involving in CKC and the reasons are as follows:
- The project aimed at identifying root causes of customer dissatisfaction with CMSorg. The outcome of this approach could reduce their workload. This emerged from comments that are as follows:
It’s the priority for our team to investigate high level of customer dissatisfaction. If we can find the reason behind high level of customer complaints, we will invest our time on improving our service rather than investigating this issue
If we can find the similarities between our customer complaints, we can identify the department responsible for it rather than investigating all the functions
- They did not consider customer feedback as a valuable source of investigating the customer experience. Examples of comments made by experts are as follows:
They (customers) just complain because they don’t want to understand how we operate and even when we try to tell them we are investing in service improvements we cannot satisfy them because they think we do not care about our customers
It’s good to make use of all data that contains customer comment which we kept compiling
2. Learning by stakeholders
The internal stakeholders affirmed that their participation had positive impact on their understanding of the problem and it contributed to improving their knowledge base. They stated that their perception about customer experience has changed and they value investigating customer complaints from different perspective. Some of their comments that were extracted from the data collected are as follows:
It helped our department to understand customer perception and how simply valuing it could save us many</td></tr>
</table>

Table 6-4. Key ideas and themes from the CKC project at CMSorg

	complaints and penalties *It clarified that what we considered very rare customer experience in terms of being unhappy about a service is very common and also very important for the customers* 3. New explicit resources became available This approach creates the path to identifying and mapping root causes of a specific complex problem. For CMSorg, it was unexpected to see the factors it did not consider very important are the causes of many of its customer complaint which had been captured and stored without being reviewed. Moreover, it became evident that many of call centre employees have reliable knowledge about customer experience that could help the CMSorg to address its complex problem. Customer service expert's comment about this issue was as follows: *CMSorg believed only a very few number of its customers might be dissatisfied with the organisation just because they had bad experience with the call centre and now we understand how this assumption created such a gap in our analysis* 4. New communities of interest For the customer service experts, it was the first attempt to review the outcomes of customer complaint analysis with all the details and percentages of complaints and refer to their knowledge and experience of dealing with customer enquiries. They found this opportunity to learn that their colleagues had experienced the same issues in regards to not feeling comfortable about communicating their experience with managers before this project for the reason that the value of their experience had not been explicitly verified. Summary of one of the comments is as follows: *I always thought if I complain about the new software and how it has increased the number of employees' errors and the amount of time we need to correct the mistakes; it might be understood as my lack of experience or just complaining about colleagues' work. Now it is clear that it has an influence on customers complaints too, I can discus my ideas freely with my manager*
B. Mapping the root causes of the complex problem	The process of developing charts and models that assists mapping the root causes of customer dissatisfaction with CMSorg included two interconnected steps that are as follows: - Intensive analysis of 9,000 comments about CMSorg service from its customer. Interpretation of results were evaluated through constant discussion of customer feedbacks that comprise their dissatisfaction about work of different departments of CMSorg with experts from relevant individual departments - Identifying factors that might have negative impact on communication between diverse stakeholder groups

Table 6-4. Key ideas and themes from the CKC project at CMSorg

	These let to simplifying the complex problem to a significant extent and better understanding of customer needs and perception of CMSorg service. Some of the comments from the experts that highlights this realisation are as follows: *This has been a necessary and reliable way of extracting customer knowledge about our service* *This truly creates a new path to improving customer experience*
C. Participants	In addition to considering feedback from 9,000 customers who participated in CMSorg telephone survey which was suggested by the researcher, other participants were selected by the CMSorg customer relations analyst and managers of relevant departments. In terms of the selection of experts, management was aware of the value of the knowledge and experience of Strategy, Customer Insight and Assurance Team, therefore facilitated their participation as much as it was required With regard to stakeholders, customer service experts from three key internal stakeholders of the knowledge about customer experience, operation, credit and general enquiries departments, were selected by each managers of each department managers
D. Type of knowledge	Knowledge about customer experience, customer complaints, services provided at call centre of different departments and call centre employees were captured from customer service experts to evaluate customer feedbacks which identified their complaints or dissatisfaction with the work of CMSorg at its call centre (CMSorg customers were not aware of the fact that each department runs its own call centre that are all located at the CMSorg headquarter)
E. Communication technologies	Other than customer feedbacks which were collected and stored using information system, information and communication technologies were only used to support the preparation and running CKC project. E-mail in particular was only used to organise every meeting, share documents related to running the project or documentary evidence. Data projector was used, occasionally
II. Other approaches. The limitations of existing approaches to CKC in comparison with the application of Ep-s	
A. Demands from participants	The CKC project at CMSorg used the comments from customers who were willing to participate in the telephone survey conducted by this service organisation. The participants from Strategy, Customer Insight and Assurance Team were dedicating their time and effort into investigating the reasons behind high level of customer complaints, in particular because of the pressure from regulatory bodies and the penalties this organisation has been receiving; therefore they participating in this project were considered part of their job and mission. This project only required insignificant time of other customer service experts and for the same reason which was the pressure from regulatory bodies and the penalties this organisation has been receiving, their participation in finding the root causes of customer dissatisfaction was

Table 6-4. Key ideas and themes from the CKC project at CMSorg

	seen very important for the organisation
B. Collaborative environment	Except the customer comments which in many cases was difficult to understand without further review of documentary evidence and discussion with experts or the comments that were difficult to recite and relate, there is no evidence in the data collected to suggest that the CKC project was limited by the ability of participants to contribute their knowledge
C. Motivation	A presentation was given to CMSorg at the end of the project in an attempt to relate Ep-s outcomes to critical success factors for the service organisation. The CMSorg representative discussed the value of the CKC project. One of his comments is as follows: *It helped us to understand our customers' expectations; it helped us to recognise how we have been investing on improving our service according to their needs when we neglected understanding their ideas of for example not knowing where their money goes….*
III. Group dynamics. Ep-s and leading group dynamics	
A. Trust	Only at the beginning of the CKC project at CMSorg there was some resistance to openly discuss the unsuccessful work that has been done to understand high level of customer complaint or to freely clarify that such a complex problem exists. This issue was determined and addressed which become one of the key steps of Ep-s. Since this issue was clearly eliminated, CMSorg introduced this project as trustworthy to the internal stakeholders which allowed them to openly share their knowledge and discuss about CMSorg service and its problem, during the rest of the CKC process.
B. Communication	The observation and notes taken during the CKC meetings show that participation was not restricted to experts' contributions. Stakeholders contributed actively to the discussions, even when it was only to raise questions and concerns in the search for experts' answers and support.
C. The role of leader(s)	From the beginning of CKC project at CMSorg, the researcher familiarised herself with CMSorg area of work and its customer experience through valuable resources which are as follows: - Reviewing available literature on the topics of CMSorg background, collaboration with diverse stakeholder groups and customer complaints about service organisations. - Reviewing documentary evidence provided by CMSorg - Reviewing 9,000 customer comments on CMSorg service which were in the form of qualitative text - Conducting the field research at the CMSorg headquarter that facilitated freely observing the work call centre employees, attending staff training and conducting number of open-ended interviews with experts This familiarisation process assisted the researcher to successfully run the CKC meetings. The CMSorg representative who was an expert in analysing customer

Table 6-4. Key ideas and themes from the CKC project at CMSorg

	experience also had the collaborative leader role. His experience and connection with internal stakeholders helped the CKC project in terms of identifying and engaging experts with problem-centred knowledge from relevant department. His area of expertise also contributed to the accuracy of the data analysis.
IV. Evaluation. Evaluation of Ep-s as an approach to CKC	
The CKC project was evaluated based on getting feedback from the participants at two levels that are as follows: 1. At the organisational level The CMSorg prepared a reference letter for the researcher to highlight the value of this project for this service organisation. This letter is available in appendix A in section A1.5. 2. At the individual level The researcher investigated the value of CKC project for the individuals mostly at the end of the CKC meetings or open-ended interviews. All the participants from the Strategy, Customer Insight and Assurance Team and customer service experts found this project beneficial for understanding CMSorg customers' needs and expectations. They also found this project created an opportunity for them to have a better and more accurate communication with different departments and also with the customers	

Once relevant themes and frequent ideas for each individual case had been extracted, the analysis moved on to analyse those patterns that were valid across the cases in the multiple case study. This process was based on the same codes that were employed for the second cycle coding, presented in Table 6-4.

Based on the concepts included in Table 6-4, Table 6-5 presents collection of the main ideas and themes that resulted from cross case analysis of the data collected.

Table 6-5. Cross-case analysis: key ideas and themes

I. Ep-s approach. The implementation of CKC based on collaborative problem-solving	
A. Outcomes of the application of Ep-s	Ep-s successfully involved all the participants in CKC projects, regardless of their profession or their lever of skills and expertise, in the knowledge creation. It became evident that identifying and engaging individuals with problem-centred knowledge is more important to focus on in comparison with relying on area of expertise. The application of Ep-s resulted in producing displays of factors influencing the problem and network models that presents the relationship between root causes of the complex problem which were significantly useful for the organisations involved in CKC projects. The application of Ep-s contributed to business performance of CMSorg which is one of the largest service organisations in the UK. The application of Ep-s at BRS contributed to the development of a new tool for understanding cause and effect of safety incidents which has important value for the rail industry in the UK.
B. Mapping the root causes of the complex problem	In particular, for solving service-related problems which are complex and more difficult to specify in comparison with product-related problems, the process of mapping the root causes of the problem significantly helped the service organisations in term of addressing complex problems. Mapping the root causes of the problem also helped the participants to better understand the problem domain and contribute to knowledge creation.
C. Participants	Ep-s, considerably, identifies the importance of engaging the right people in the process of identifying, selecting and engaging the right participants for CKC. The involvement of experts from CMSorg and BRS in the project initiation and project preparation, the first phase of Ep-s, significantly contributed to the success of its application.
D. Type of knowledge	This new approach to CKC successfully involved individuals with problem-centred knowledge which included individuals from the stakeholder groups that have influence on the problem, the stakeholder groups that are affected by the problem and stakeholder groups that have experience about solving complex problems in specific service industries.
E. Communication technologies	Information system was used only at CMSorg. Although it helped the CKC project in terms of involving feedback in the form of qualitative text from 9,000 customers, it only proved its value for knowledge transfer. Communication technologies were only used for the purpose of transferring data between the researcher group from CU and participants from different organisations and organising CKC.
II. Other approaches. The limitations of existing approaches to CKC in comparison with the application of Ep-s	
A. Demands from participants	The implementation of Ep-s only required participation in CKC meetings. The organisations involved were willing to allow experts to participate in CKC meetings for the reason that these meetings were necessary for addressing their complex problems. There is no evidence to suggest that this demand had a negative influence on the collaborative knowledge creation.

Table 6-5. Cross-case analysis: key ideas and themes

B. Collaborative environment	No evidence was collected that suggest any of the participants found it difficult to contribute their knowledge during the CKC meetings.
C. Motivation	Ep-s assists the participants in understanding the purpose of CKC project and, more importantly, assists them in creating credible problem resolution. These characteristics significantly motivated the participants to freely express their perceptions and contribute to knowledge creation.
III. Group dynamics. Ep-s and leading group dynamics	
A. Trust	Trust was identified as an issue at the initial stage of the development of Ep-s. This issue was clearly identified and become one of the key steps of Ep-s. Evidence shows that clarifying the purpose of the CKC meetings leaded the participants to openly contribute their knowledge and experience.
B. Communication	Evidence shows that all the participating individuals in applications of Ep-s made a significant contribution to knowledge creation
C. The role of leader(s)	In some cases, involving leader(s) from the area of knowledge management and leader(s) with problem-related experience make the application of Ep-s more feasible. The CKC leader from CMSorg significantly helped the process of selecting experts and inviting them to engage in CKC meetings. Moreover, the CMSorg project involved one service organisation and familiarising the researcher with its service and complex problem prior to conducting CKC meetings was a manageable task, therefore, she successfully ran the meetings. However, the number of the organisations involved in BRS project, complexity of the problem and lack of the researcher's experience in running such CKC meetings proved that involving skilled collaborative leader and an expert who has enough problem-related knowledge is essential for the effective CKC meetings.
IV. Evaluation. Evaluation of Ep-s as an approach to CKC Ep-s was evaluated, in most cases, by getting feedback from the participants. These feedbacks were collected after the CKC meetings to capture the perception of the participants about the value of what they achieved through CKC on the critical success factors of their organisations.	

6.2.4. Theoretical constructs

The researcher significantly summarised the data collected the emerged across the multiple case study to group of patterns and tried to generalise these findings through developing a series of theoretical constructs.

Auerbach and Silverstein (2003, p.69) affirm that the procedure for creating theoretical constructs from themes has the same form as the procedure for creating themes from repeating ideas. They explain that theoretical construct consists of grouping of themes and ideas into abstract ideas consistent with the theoretical structure of the research. Miles et al. (2014) remark that developing theoretical constructs facilitates creating conceptual level from empirical data.

The researcher developed a number of theoretical constructs from the cross-case data analysis carried out in this section. The results of the cross-case data analysis as presented in Table 6-5 became essential for justifying the building of theory from the data collected. Using as an example the value of models as an additional outcome of the implementation of Ep-s, Table 6-5 shows the process of building a theoretical construct using the data collected across the multiple case study.

Table 6-6. Building a theoretical construct: The models resulting from the implementation of Ep-s

Organisation	**Results of the data analysis**	**Theoretical construct**
CMSorg	9,000 comments about customer experience in form of qualitative text were coded and categorised which became valuable tool for verifying the outcomes of data analysis for this organisation. Series of tables and charts developed became an important explicit resource for this service organisation. These displays clearly illustrated the factors influencing customer dissatisfaction, the importance of each factor, the relationship between different factors and also customer's suggestions for service improvement. Series of network models developed became an important tool for mapping the poor knowledge creation channels between different stakeholder groups of CMSorg.	In addition to effective CKC, running Ep-s approach is likely to bring other benefits to the organisations involved, including models of different aspects of the problem domain. Such models might become an explicit source of knowledge for reference by the organisations.
BRS	Series of data models developed became an important tool for the BRS and other organisations from rail industry as it could be used to map cause and effect of safety incidents. It also could be further developed or reduced based on the user's requirements in investigating specific safety-related issue.	

Following a process similar to the one outlined in Table 6-6, the theoretical constructs (TC) were built that are as follows:

TC.1. In the conditions of the organisations involved in this research, face-to-face, led by collaborative leader and collaborative mapping of root causes of complex problems is a valid approach to CKC

TC.2. Ep-s is a valid approach for implementing collaborative knowledge creation that is based on face-to-face, led by collaborative leader(s) and collaborative mapping of the complex problems

TC.3. In addition to the collaborative knowledge creation, running Ep-s has the potential to bring other benefits to service organisations involved such as outcomes which may become an explicit source of knowledge for reference by the service organisation

TC.4. CKC projects are more likely to be successful if they have a clearly defined focus. The organisation has an important role to play in identifying and selecting potential participants and also motivating those potential participants to accept to participate in CKC meetings

TC.5. Ep-s has been perceived as a successful approach to collaborative knowledge creation by the organisations involved in CKC projects

TC.6. Communication technology is not a necessity for the success of collaborative knowledge creation

TC.7. Based on the experience of the organisations involved in the multiple case study there is no evidence that suggests that the demands of implementing Ep-s have a negative effect in maintaining its purpose

TC.8. The data collected show that individuals involved in collaborative knowledge creation using Ep-s feel motivated to contribute their knowledge and learn from other participants. Ep-s supports and values freely communicating participants' perceptions of the problem and collaboratively developing credible problem resolution. Creating credible problem resolution without encountering significant disagreement between stakeholders requires addressing the complexities associated with limited sense of shared characteristics and common knowledge between the participants

TC.9. CKC leader(s) have key role in the success of a CKC meetings based on the implementation of Ep-s. The role of CKC leader(s) is one of co-ordinating and supporting the process by which experts and stakeholders create knowledge

TC.10. The success of Ep-s as an approach to CKC can be assessed by exploring the alignment of its outcomes with the critical success factors of the organisation as perceived by the organisation

6.3. Drawing and verifying conclusions

At this stage the evidence collected in order to answer the research questions has been substantially summarised and basic theory, consistent with the theoretical framework of the research, has been built. This work has prepared the way for the drawing and verifying the conclusions of the data analysis.

6.3.1. Drawing the conclusions

Dealing with the secondary research questions

The theoretical constructs built and represented in section in section 6.2.4 became important tools in the process of drawing the conclusions of the multiple case study. Many of the constructs represented in themselves part of the answer to the secondary research questions that led this research, which were outlined in chapter one that are as follows:

RQ.1. How can collaborative knowledge creation benefit from engaging the right stakeholder groups?

RQ.2. What does the concept of collaborative knowledge creation mean and what is its relationship with problem-solving?

RQ.3. What is the relationship between group dynamics and success of collaborative knowledge creation?

RQ.4. What is the role of communication technologies in the process of collaborative knowledge creation?

RQ.5. How can success of the process of collaborative knowledge creation be assessed?

In addition to the theoretical construct there were two other key sources of input to answer the secondary research questions. These sources of input were as follows:

- The findings of the literature review, presented in chapter three of this thesis
- The development and refinement of Ep-s during the field research that are described in chapter four of this thesis

The process of addressing the secondary research questions, at least partially, using these key sources of input is shown in Table 6-7.

Table 6-7. The process of addressing the secondary research questions

Secondary research question	Sources that contribute to the answer
RQ.1	Literature review, field research, TC.1, TC.2, TC.4, TC.6, TC.9
RQ.2	Literature review, field work, TC-8, TC-9, TC-10
RQ.3	Literature review, field research, TC.3, TC.9
RQ.4	Literature review, field research, TC.6
RQ.5	Literature review, field research, TC.10

Dealing with the primary research question

The primary research question had been defined in chapter one that is as follows:

> ***How to reduce the limitations of existing approaches to collaborative knowledge creation in service industries?***

It is analysed in chapter one, how the secondary research questions derived from the primary research question. As a result, it was found during the data analysis that answers to each of the secondary research questions contributed to the answer of the primary research question.

In order to address the primary research question, the following conclusions were drawn based on the assessments from participants in the multiple-case study as it has been described in this chapter:

- Ep-s is a valid approach to engaging diverse stakeholder groups in collaborative knowledge creation
- Ep-s is a successful approach for the implementation CKC
- Ep-s reduces some of the key limitations of existing approaches to CKC

Table 6-8 is intended to assist the reader understand the extent to which the data collected shows that Ep-s reduces the limitations of existing approaches to CKC. The analysis is based on the comparison of observed outcomes of Ep-s during the field research and known deficiencies of other approaches as identified in the review of the literature, chapter two of this thesis.

Table 6-8. The evidence that suggest Ep-s reduces the limitations of existing approaches to CKC

Limitations of existing CKC techniques	**CKC approaches that face these limitations**	**Evidence that suggest Ep-s reduces these limitations**
The characteristics of the knowledge sought to be employed to contribute to knowledge creation limit the success of CKC techniques	The applicability of knowledge limits the outputs of methods that were used within the field of information system The variety and complexity of the knowledge to be discussed limits success of the approaches applied to knowledge creation within the fields of information system and collaborative learning The perceived validity and quality of knowledge limits success of approached to CKC within the field of knowledge management The rational, emotional and political issues that characterise the knowledge being discussed for the purpose of knowledge creation affects the success of action learning as a knowledge creation approach The psychological validity of the knowledge may impact success of the approaches applied in the field of training and development, as the newly created knowledge is not always likely to be applied The volume and issues related to the maintenance of knowledge stored in social software affect the value of these as knowledge creation tools	Ep-s has been successful in the knowledge creation relating to different aspects of the service organisations activities and in different contexts. These included knowledge relating to areas that are as follows: - The process of investigating customer complaints at CMSorg - The process of interacting with customers at CMSorg - The process of investigating customer dissatisfaction with CMSorg - The process of investigating factors influencing the safety of rail transport at different organisations within diverse stakeholder groups of rail industry - The process of communicating safety-related data between different organisations within diverse stakeholder groups of rail industry The data collected highlights that individuals and organisations involved were ready to apply the newly created knowledge immediately after the CKC projects
The significant demands that the CKC processes impose on participants	The time and skills required to describe knowledge in a structured way and add information on the context of the specific experience limited success of the approaches used within the field of information systems to engage individuals in	Based on the experience of the organisations involved in the multiple case study, implementing Ep-s involved a number of staff for relatively short periods of time The analysis of discussions held during the CKC sessions would potentially yield additional results

Table 6-8. The evidence that suggest Ep-s reduces the limitations of existing approaches to CKC

Limitations of existing CKC techniques	**CKC approaches that face these limitations**	**Evidence that suggest Ep-s reduces these limitations**
	contributing their knowledge The complex patterns of interaction among analysts and individuals who have the knowledge during the knowledge creation process affects success of the approaches applied within the field of information systems Time, skills and resources required by experts to contribute knowledge, and time and effort required by stakeholders affect the success of methods applied within the field of collaborative leadership The stresses and demands that an action learning project can impose on participants could limit success of the action learning approach to knowledge creation As within the KM field, the use of communication technologies for knowledge creation is affected by the time, skills and effort required from the individuals involved	It is acknowledged that such an analysis would require a significant amount of additional time. However, data collected suggests that organisations were satisfied with the direct outcomes of the CKC project
Problems related to the selection of experts and to their ability to contribute their knowledge	Knowledge creation approaches used in the fields of information system and collaborative learning were affected by relying on the views of a single expert as they were unable to reconcile different and sometimes conflicting views. The potential difficulties in identifying experts in the workplace affects the methods applied to CKC within the field of knowledge management Action learning projects are affected by what has been termed 'the expert solution': when experts are part of the problem-solving groups, members look to them for solutions rather than collaboratively creating knowledge	Ep-s is a structured process that relies on the organisation's awareness of its needs to involve specific knowledge resources and create knowledge by specific individuals. It does not include a stage or guidelines concerned with the selection of participants. Instead, it understands that the organisation itself has the best possible view of the experience of its employees and is therefore in the best position to appoint those that will participate as experts. Although this may still be considered as a limitation, Ep-s offers an alternative view to some of the existing techniques that rely on expertise spontaneously emerging from unknown organisational sources Once the team of CKC participants has been formed, the structure of the approach, the nature of the collaborative mapping of root

Table 6-8. The evidence that suggest Ep-s reduces the limitations of existing approaches to CKC

Limitations of existing CKC techniques	**CKC approaches that face these limitations**	**Evidence that suggest Ep-s reduces these limitations**
		causes of complex problem and the leadership techniques applied seek to elaborate the experts' contributions Evidence collected during the field research shows that most experts have been able to contribute their knowledge throughout the different stages of each of the CKC project The method helps the participants to create a credible problem resolution which eliminates the problem of conflicts of perceptions among them
Motivational issues related to engaging potential participants in CKC	How to motivate individuals to contribute their knowledge has been one of the most important issues to resolve in most fields that have relied on collaborative knowledge creation, such as the field of knowledge management. Similarly, users of the knowledge newly created by experts often refuse to apply it due to a number of reasons In particular, within fields such as information system failure has been related to the fact that individuals are often restrained by their motivation when striving to express, apply, and explain their knowledge	Based on the evidence collected throughout the field research, all participants in each of the applications of Ep-s were significantly motivated to share their experience and collaboratively create knowledge, and all of them would recommend others to participate in similar projects The data collected shows that during each CKC meeting experts contributed to the knowledge creation. Experts also asked and were willing to learn from others doing, for example, different types of work As for stakeholders, data collected shows that in most cases they found it useful to have the opportunity to discuss issues directly with the experts (which also contributes to the assessment of the approach to selecting the experts).

The conclusions of this research, which address the primary research question, have been derived from the clustering of the theoretical constructs included in Table 6-9. While doing this, the researcher required to ensure that there was enough evidence in the data collected to support each conclusion. Thus the conclusions drawn would not only be conceptually coherent but also supported by the perception of participants in the multiple case study.

Table 6-9. Drawing conclusions: The clustering of theoretical constructs

Theoretical constructs	Resulting conclusions
TC.1. In the conditions of the organisations involved in this research, face-to-face, led by collaborative leader and collaborative mapping of root causes of complex problems is a valid approach to CKC TC.2. Ep-s is a valid approach for implementing collaborative knowledge creation that is based on face-to-face, led by collaborative leader(s) and collaborative mapping of the complex problems TC.3. In addition to the collaborative knowledge creation, running Ep-s has the potential to bring other benefits to service organisations involved such as outcomes which may become an explicit source of knowledge for reference by the service organisation TC.4. CKC projects are more likely to be successful if they have a clearly defined focus. The organisation has an important role to play in identifying and selecting potential participants and also motivating those potential participants to accept to participate in CKC meetings TC.5. Ep-s has been perceived as a successful approach to collaborative knowledge creation by the organisations involved in CKC projects TC.6. Communication technology is not a necessity for the success of collaborative knowledge creation TC.9. CKC leader(s) have key role in the success of a CKC meetings based on the implementation of Ep-s. The role of CKC leader(s) is one of co-ordinating and supporting the process by which experts and stakeholders create knowledge	Conclusion 1: Face-to-face, led by collaborative leader and collaborative mapping of root causes of complex problems is a valid approach for the engaging diverse stakeholder groups in CKC Conclusion 2: Ep-s is a successful method for the implementation of face-to-face, let CKC through collaborative mapping of root causes of complex problems
TC.4. CKC projects are more likely to be successful if they have a clearly defined focus. The organisation has an important role to play in identifying and selecting potential participants and also motivating those potential participants to accept to participate in CKC meetings TC.5. Ep-s has been perceived as a successful approach to collaborative knowledge creation by the organisations involved in CKC projects TC.7. Based on the experience of the organisations involved in the multiple case study there is no evidence that suggests that the demands of implementing Ep-s have a negative effect in maintaining its purpose TC.8. The data collected show that individuals involved in collaborative knowledge creation using Ep-s feel motivated to contribute their knowledge and learn from other participants. Ep-s supports and values freely communicating participants' perceptions of the problem and collaboratively developing credible problem resolution. Creating credible problem resolution without encountering significant disagreement between stakeholders requires addressing the complexities associated with limited sense of shared characteristics and common knowledge between the participants	Conclusion 3: Ep-s reduces some of the key limitations of existing approaches to collaborative knowledge creation

6.3.2. Verifying the conclusions

Meaning has been generated from a large set of data. The findings of the research have been interpreted. A large section of this chapter has focused on describing how the researcher arrived at such findings. However, actions were taken during the final stage of the data analysis to confirm the findings in order to address an issue that affects qualitative research: the validity of conclusions.

There are many different tactics for testing or confirming the findings of qualitative research. These include, weighting the evidence, using extreme cases, looking for negative evidence and many others (Miles *et al.*2014). Most of these have as their ultimate aim addressing concepts such as the representativeness, reliability and replicability of the findings. A review of the different approaches that exist is beyond the scope of this section.

There are no agreed-upon mechanisms to indicate whether findings of qualitative research are valid and procedures are robust (Miles *et al.*, 2014; Yin, 2014). Therefore, the researcher followed a process that has been classified by Miles *et al.* (2014, p. 309) as *one of the most logical sources of corroboration* that is getting feedback from participants. They emphasise that participants' evaluation of the research findings is one of the most logical and reliable tactics for confirming findings.

The researcher included some of the feedbacks she received after conducting the CKC meetings, throughout the multiple case study, in relevant part of this thesis. The written feedback she received from CMSorg is included in appendix A section A.5. The key points included in this feedback in regards to verifying the conclusions are as follows:

- *It supported CMSorg in development of a fledgling programme designed to drive actionable insight from customer feedback. The goal was to turn the wealth of knowledge locked up in verbatim comments and turn them in actions that would drive improvements in customer experience*
- *It helped CMSorg to understand the gap in its analytics capabilities*
- *It provided CMSorg with a solution to drive new localised short term improvements to deliver small but rapid change*

The assessment of some of the participants from BRS project identified some benefits of these collaborations that are as follows:

- *It developed tools that supports the rail industry in their efforts to understanding the potential root causes of some of the safety incidents*
- *The stakeholders participated in the design-shop found this collaboration the start point of realising how different groups of stakeholders within the railway industry are working on very similar problems associated with safety, in total unawareness of each other.*

These perceptions of the firms involved in this research represent their understanding of the finding of this research and maintain confirming findings. The researcher considered that these views were representative of the perception of the organisations involved in the research, and therefore the conclusions presented in this chapter are considered valid. With this step, the data analysis was concluded.

6.4. Summary

This chapter has described in detail how the data collected during the field work was analysed. The body of data collected as a result of the implementation of a multiple case study was reduced to manageable contents that were then displayed using tables. Data were analysed for every individual application of Ep-s. This was then followed by a cross-case analysis. Theoretical constructs were derived from the analysis. Some of these, in conjunction with the findings of the literature review and the field research, provided answers to one or more of the secondary research questions that drove this research. The conclusions of the field research, which address the primary research question, were drawn from those theoretical constructs. This chapter also described how the validity of the conclusions drawn from the data collected was assessed.

Chapter seven will discuss the main issues that emerged from this research and also analyse the areas that will benefit from further research.

CHAPTER SEVEN

7. DISCUSSION AND FURTHER RESEARCH

This chapter includes summary of the results of this research. It covers the overview of the path taken in this research followed by discussion of its primary contributions. It describes the limitations of research conducted and suggests areas for further research.

7.1. Overview of the path followed in the conduct of the research

The collaboration between Coventry University and CMSorg introduced the potential demand for new approach to stakeholder engagement in solving complex problem. This collaboration provided the drive for developing a new generic question, how to identify stakeholder groups who have problem-centred knowledge and how to successfully engage them in knowledge creation? The review of the literature explained the tangible and intangible problems that hinder the success of existing approaches to involving different stakeholder groups in knowledge creation. This motivated the research to formulate a more precise primary research question that is as follows: How to reduce the limitations of existing approaches to collaborative knowledge creation in service industries? The analysis of this primary research question was followed by identifying a number of secondary research questions and a conceptual framework which defined the scope within which the issues related to CKC was to be studied by this research.

The next parts of this research revolved around development of the new approach based on the implementation of CKC projects with different organisations from two service industries. The specific dimensions of this new approach were developed through employing the lessons learned from the collaboration with CMSorg. The researcher called this new method Effective Problem-Solving (Ep-s) which was developed as practical process of collaborative leadership for implementing successful CKC. in subsequent stages of this research, the analysis was based on comparing the limitations of existing approaches to CKC that were identified and reviewed in the relevant literature review reported in the body of this thesis

with the empirical findings of the implementation of Ep-s in different types of service organisations.

The factors that has been driven the path taken in this research can be described in three key areas are as follows:

- The need for involving individuals who are affected by the problem, individuals who have influence on the problem and individuals who have problem-centred knowledge in knowledge creation process
- The need for a new approach that addresses limitations of existing approaches to CKC
- The success of a new problem-solving approach to CKC based of collaborative leadership

7.2. Key contributions of this research

The new approach to CKC is the lead in identifying the original contribution of this research that is the answer to the primary research question of this research. The practical process of the new approach to CKC projects, reported in this research, suggests that it has certain advantages over the existing approaches. In addition to the original contribution of this research, this research contributed to success of a key service organisation and a key service industry, in the UK, in solving complex problems. This section will review these contributions in some details.

7.2.1. Contribution to the body of knowledge in the field of CKC

A successful approach to stakeholder engagement in CKC has been developed, refined and validated in the field. This approach addresses the challenges associated to identifying, selecting and effectively engaging individual who have problem-centred in CKC which comprises the key to reducing the identified limitations of existing other approaches.

In order to clarify the process of applying this new approach to CKC in practice, this research designed Ep-s approach which defines a lead-in steps that organisations and industries can run.

For the development of Ep-s, it was essential to review of the main areas that indicated negative impact of CKC limitations on their applications. This thesis included this review that

comprised a summary of the benefits and limitations of existing approaches to CKC in different fields including knowledge management, information system, organisational learning, collaborative learning, training and development, action learning and collaborative leadership. The results of such a review become an additional contribution to the body of knowledge in the field of CKC.

Identified limitations of existing approaches to CKC and the findings resulted from the applications of the new approach in the field verifies that the new approach has been successful in some significant areas that are as follows:

- It encourages effective collaboration between members of a group beyond the conventional group works
- It addresses the challenges associated with communication between individuals or organisations across knowledge boundaries
- It revolves around involving individuals who have problem-centred knowledge without being concerned about their skill or expertise but their experience
- It involves individuals and organisations that are affected by the problem in addition to involving individuals and organisations who have influence on the problem
- It creates conceptual environment that enables effective problem-centred knowledge transfer across the stakeholder boundaries
- It provides an environment that engages diverse stakeholder groups to contribute to knowledge creation

7.2.2. Contribution to the success of the service organisation and service industry involved in this research

Two collaborative projects at knowledge-intensive organisations from two major service industries were successfully completed throughout this research. These two collaborations that formed the multiple-case study in this research are follows:

- CMSorg. CMSorg is one of the key service organisations in the UK
- Britain Rail Service (BRS). BRS is one of the key firms within the UK rail industry. In addition to BRS, eight leading organisations from UK rail industry participated in the BRS project.

The assessment of some of the participants from these two firms identified some benefits of these collaborations in addition to the primary benefits of CKC that are as follows:

- *It helped CMSorg to understand the gap in its analytics capabilities*
- *It developed tools that supports the rail industry in their efforts to understanding the potential root causes of some of the safety incidents*

7.3. Limitations of the research

The two broad issues that determine the limitations of this research are as follows:

- The characteristics of CKC domain
- The practicalities of the implementation of CKC projects

7.3.1. The characteristics of CKC domain

Collaboration and knowledge creation have been addressed by this research as two interconnected processes that are related to transferring, sharing, and evaluation of knowledge towards creation of new knowledge. Moreover, the definition of knowledge in the literature varies from one author to another; some authors consider knowledge and information as one concept and some authors consider knowledge and experience as one concept. The same principle applies to the definitions of expert and experienced. Therefore, understanding the meaning of each of these concepts and patterns of studying them is a challenging work.

During the implementation of this research, it became evident that the human nature of knowledge creates the challenges associate with identifying individuals with problem-centred knowledge, individuals' willingness to share their knowledge with others, describing one's knowledge to others, motivating them to engage in collaboration and assisting them to contribute to knowledge creation. In terms of describing one's knowledge to others, for example, diverse characteristics of internal and external stakeholder groups add to the difficulty of knowledge transfer between different stakeholder groups, for example at stakeholder boundary – between CMSorg and its customers – on one hand the service provider found customers' problem too difficult to understand and on the other hand customers found the advices they receive being too complicated to understand. However,

these issues had less adverse effect during the CMSorg project than the BRS project with diverse characteristics of organisations from more than two stakeholder groups.

Additionally, lack of common knowledge between researcher(s) and different stakeholder groups creates additional boundary and spanning this boundary is time consuming and fails if the mutual understanding of the problem in hand does not take place at the early stages of collaboration.

The nature of CKC research domain comprises a share of significant number of characteristics with other areas such as psychology and stakeholder theory. The scope of this research could only allow a limited study of some of these characteristics that are as follows:

- Demographic characteristic

  This research revolved around one specific demographic characteristic, in the implementation of CKC projects that is the level of problem-related experience and problem-centred knowledge of individuals. Issues related to other demographic characteristics such as age or gender of participant has not been studied in this research.

- Group dynamics

  The significant impact of individuals' behaviours towards engagements in collaborations on the process of CKC is inevitable. This research could address the issues related to the group dynamics to a limited extent through collaborative leadership. Moreover, there are issues related to collaborative leadership, itself, that also could be studied only to a limited extend. These include the process of identifying and selecting right number of leaders, evaluating their skills or experience and clarifying their role in the CKC projects.

- Collaborations at intra-organisational and inter-organisational levels

  The researcher was aware of the issues related to facts such as organisational structure which has significant impact on individuals and groups actions and interactions within and across organisations that can determine the success of implementation of a CKC project. However, the context of this research allowed the researcher to cover these issues only to a limited extent.

7.3.2. The practicalities of the implementation of CKC projects

The nature of collaboration and knowledge creation leads the studies in these areas to take place in a real-life context which required accessing many sources of data, which are only available within stakeholder groups, followed by collecting data from a range of documentary evidence, review of participants' qualitative text, discussions with participants, interviewing participants and observing the development of CKC process by the researcher. The field research opportunity, although limited, supported the researcher to collect enough evidence to study the success of CKC at organisational level during the collaboration with CMSorg. However, the number of stakeholder groups from different organisations involved in BRS project conflicted with time and resources required to conduct additional CKC project at each organisation before engaging them in industry-wide CKC. Therefore, the issues that bounded the practicalities of the implementation of Ep-s at industry level to be studied to a limited extent are as follows:

- Diverse stakeholder groups have different perception of the factors affecting the problem and they also have different understandings of desirable solution
- Individual stakeholder groups focus on the factors affecting their organisation rather than the ones affecting their domain as one whole
- Managing the impact of conflicting priorities
- Moderating the impact of knowledge diffusion across stakeholder boundaries

It became evident for the researcher that applications of Ep-s within stakeholder groups would have positive impact for its further development and assessment.

7.4. Areas of further work

The researcher has identified two areas of opportunity for further work that are as follows:

1. The study of factors that are likely to influence the effectiveness and efficiency of the new approach to CKC
2. The study of factors that are likely to influence the applicability of the new approach in other contexts

7.4.1. The effectiveness and efficiency of the new approach to CKC

The new approach to CKC would benefit from three groups of features that can address the limitations of the approach identified in this research. These groups of features are as follow:

- The relationship between demographic characteristics and success of the new approach to CKC

In addition to the participants' problem-centred knowledge, their other demographic characteristics such as their age and backgrounds could have different impacts on the implementation of the new approach to CKC. Therefore, a new setting can include the effects of variety of demographic characteristics on the CKC process. Consequently, including more specific criteria for selecting participants could add to the efficiency of the Ep-s.

- The relationship between group dynamics and success of the new approach to CKC

The application of Ep-s at BRS showed that engaging different organisations from diverse stakeholder groups proposed more challenges associated with managing group dynamics in terms of promoting trust among them and motivating them to contribute to knowledge creation. Therefore, considering a more precise study of spanning stakeholder boundaries could add to the effectiveness of Ep-s.

- The unit of study and success of the new approach to CKC

It is also important to further study the problems related to organisational factors that affect the success of the new approach. Some of the organisational factors are the level of support that individuals receive from the organisation to participate in collaboration. Competition between functions of an organisation or between different organisations of one service industry could provide a new setting for the study of the success of Ep-s in terms of motivating individuals to contribute to CKC.

There are other important issues related to the organisations involved in the application of the new approach to CKC that can be studied further which are as follows

- The applications of Ep-s were conducted through university-industry collaborations and the professional background and area of research of the CU research team had positive influence on the success of the new approach to

CKC. Moreover, the researcher dedicated significant time to familiarise herself with the participating organisations' area of work and she put every effort to learn about their problems' context. For that reason, altering the stakeholder group who runs the CKC projects could provide a new setting for the study of the success of Ep-s. The relationship between required management support from participating organisations and the success of CKC could also be studied further

- Involving many geographically distributed individuals from one particular stakeholder group through virtual environment was considered during the application of Ep-s at CMSorg. However, it was limited to one-way communication and collecting qualitative text from that stakeholder group. Moreover, the application of this approach employed face-to-face meetings for geographically distributed individuals from different stakeholder groups of BRS project through people-based approach. The feasibility of two-way communication through virtual environments, for geographically distributed individuals from different stakeholder groups who are willing to participate in the collaboration but cannot be physically present at where CKC takes place, could provide a new setting for the study of the success of Ep-s.

In addition to addressing these three key features, the application of the new approach to CKC can benefit from further research in areas such as cost-benefit analysis.

7.4.2. The applicability of the new approach to CKC in other contexts

The applications of the new approach to CKC involved different organisations and different stakeholder groups that are as follows:

- CMSorg project involved one of the key service organisations in the UK and its largest stakeholder group
- BRS project involved total of nine leading organisations from diverse stakeholder groups of the UK rail industry

Most of the organisations involved in the applications of the new approach to CKC were service organisations and the nature of service based organisations adds to the challenges associate with measuring the success of the Ep-s. Moreover, all the organisations involved in this research are from two privatised service industries within the UK. Altering any of these

criteria such as selecting product based organisation(s) for the application of Ep-s could provide a new setting for the study of the success of Ep-s.

7.5. Concluding remarks

This thesis has presented a successful research with specific benefits for a various range of stakeholder groups and has made a significant contribution to the body of knowledge in the field of knowledge management. This research has meant an opportunity for the researcher to strengthen her academic identity and industrial experience which could lead her to complete more research in the future.

The beginning of this research revolved around addressing the complexity of the CMSorg problem where CMSorg was unclear about its customers' reason for being dissatisfied with its service which motivated collaboration between the groups who are affected by the problem and who have influence on the problem through the development and application of Effective problem-solving. CMSorg found the collaborations with the researcher successful that provided them with actionable outcome. This research assisted the CMSorg to realise the potential of its tacit knowledge base. CMSorg understood the value of its resources about customer experience which were available to the organisation but had not been studies prior to this research. It also understood that its call centre is knowledge-intensive department and how it could benefit from problem-centred knowledge of its customer service employees to solve its complex problem.

The twelve senior managers from BRS and the other organisations from rail industry that participated in this research found this experience valuable for improving problem-solving and shifting the effort to finding valuable and more reliable solutions together with stakeholder groups that are somehow related to the problem and are working on addressing it in isolation. Moreover, they clarified how this research helped them to become aware of the fact that the knowledge they essentially require in their process of improving the safety of their service is available in other organisations and the fact that they can access this reliable resource. They also became aware of the significant value of mapping the factors that has key influence on the problem through collaboration with organisations that have accurate and reliable knowledge and experience.

The particular contribution of this research has been to design and test out a process to assist the process of engaging diverse stakeholder groups in effective problem-solving. Initial trials have yielded good results and suggest that the new approach to collaborative knowledge creation has real value. In particular, it promotes problem-solving in a way which has not been through existing approaches. it involves a collaborative environment where the participants explore and experience knowledge creation. This environment is open to concerned stakeholders to meet on an equal basis and co-create solutions for difficult problems. All the stakeholders, who have problem-centred knowledge or who could assist other stakeholders to better understand the problem and possible solutions, contribute to the success of the collaboration. The full potential and implications of the approach have still to be explored.

References

Abell, A., & Oxbrow, N. (2001). *Competing with knowledge: The information professional in the knowledge management age.* London : TFPL.

Ahonen, H., Engeström, Y., & Virkkunen, J. (2000). Knowledge management - the second generation: creating competencies with and between work communities in the competence laboratory. In Y. Malhotra (Ed.), *Knowledge management and virtual organisations* (pp. 282-305). London: Idea Group.

Alavi, M. (2000). Managing organisational knowledge. In R. W. Zmud (Ed.), *Framing the domains of IT management: Projecting the future... Through the past* (pp. 15-28). Cincinnati: Pinnaflex Education Resources.

Alavi, M., & Leidner, D. (2001). Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly, 25*(1), 107-136.

Alvesson, M., & Kärreman, D. (2001). Odd couple: Making sense of the curious concept of knowledge management. *Journal of Management Studies, 38*(7), 995-1018.

Alvesson, M., & Sköldberg, K. (2009). *Reflexive methodology: new vistas for qualitative research* (2nd ed.). London: SAGE.

Anantatmula, V. S., & Kanungo, S. (2011). Strategies for successful implementation of KM in a university setting. In M. E. Jennex, & S. Smolnik (Eds.), *Strategies for knowledge management success: Exploring organisational efficacy* (pp. 262-276). New York: Information Science Reference.

Ansell, C., & Gash, A. (2012). Stewards, mediators, and catalysts: Toward a model of collaborative leadership. *The Innovation Journal: The Public Sector Innovation Journal, 17*(1), 1-21.

Archer, D., & Cameron, A. (2012). Collaborative leadership. *Training Journal, June,* 35-38.

Auerbach, C., & Silverstein, L. B. (2003). *Qualitative data: An introduction to coding and analysis.* New York; London: New York University Press.

Avison, D. E., Lau, F., Myers, M. D., & Nielsen, P. A. (1999). Action research. *Communication of ACM, 42*(1), 94-97.

Baldwin, C., & Linnea, A. (2010). *The circle way: A leader in every chair.* San Francisco: Berrett-Koehler.

Barron, A. (2014). Discussion prompts: a structured approach to learner-centred discussions reinforces training's relevance and results in better learning transfer. *Learning and Development, 68*(1), 24-26.

Batatia, H., Hakkarainen, K., & Mørch, A. I. (2012). Tacit knowledge and trialogical learning: Towards a conceptual framework for designing innovative tools. In A. Moen, A. I. Mørch, & S. Paavola (Eds.), *Collaborative Knowledge Creation: Practices, Tools, Concepts* (pp. 15-30). Sense Publishers.

Bhatt, G. D. (2001). Knowledge management in organisations: Examining the interaction between technologies, techniques, and people. *Journal of Knowledge Management, 5*(1), 68-75.

Bierly III, P. E., Kessler, E. H., & Christensen, E. W. (2000). Organisational learning, knowledge and wisdom. *Journal of Organisational Change Management, 13*(6), 595-618.

Bolisani, E., & Scarso, E. (1999). Information technology management: A knowledge-based perspective. *Technovation, 19*(4), 209-217.

Bosch, V. G., & Enríquez, F. T. (2005). TQM and QFD: Exploiting a customer complaint management system. *International Journal of Quality & Reliability Management, 22*(1), 30-37.

Bosch-Rekveldt, M., Jongkind, Y., Mooi, H., & Bakker, H. (2011). Grasping project complexity in large engineering projects: The TOE (Technical, Organisational and Environmental) framework. *International Journal of Project Management, 29*(6), 728-739.

Boud, D., & Walker, D. (1996). Barriers to reflection on experience. In D. Boud, R. Cohen, & D. Walker (Eds.), *Using experience for learning (pp. 73-86). :* (pp. 73-86). Buckingham, England: SRHE and Open University Press.

Boulding, W., Kalra, A., Staelin, R., & Zeithaml, V. (1993). A dynamic process model of service quality: From expectation. *Journal of Marketing Research, 30*(1), 7-27.

Breese, R. (2012). Benefits realisation management: Panacea or false dawn? *International Journal of Project Management, 30*(3), 341-352.

Bryman, A. (2008). *Social research methods* (3rd ed.). Oxford: Oxford University Press.

Bryman, A., & Bell, E. (2015). *Business research methods* (4th ed.). Oxford: Oxford University Press.

Bstieler, L., & Hemmert, M. (2008). Developing trust in vertical product development partnerships: A comparison of Korea and Austria. *Journal of World Business, 43*(1), 35-46.

Bstieler, L., Hemmert, M., & Barczak, G. (2015). Trust formation in university–industry collaborations in the US biotechnology industry: IP policies, shared governance and champions. *Journal of Product Innovation Management, 32*(1), 111–121.

Bstieler, L., Hemmert, M., & Barczak, G. (2017). The changing bases of mutual trust formation in inter-organisational relationships: A dyadic study of university-industry research collaborations. *Journal of Business Research, 74*, 47-54.

Burck, B. (2014). Enabling the transformative journey: The DesignShop. In K. Muff (Ed.), *The collaboratory: A co-creative stakeholder engagement process for solving complex problems* (pp. 41-46). Sheffied, UK: Greenleaf Publishing in association with GSE Research.

Burgoyne, J. (2016). Evaluating action learning: a perspective informed by critical realism, network and complex adaptive systems theory. In M. Pedler (Ed.), *Action Learning in Practice* (4th ed., pp. 427-438). Gower, UK.

Burke, M. E. (2011). Knowledge sharing in emerging economies. *Library Review, 60*(1), 5-14.

Cairns, G., Ahmed, I., Mullett, J., & Wright, G. (2013). Scenario method and stakeholder engagement: Critical reflections on a climate change scenarios case study. *Technological Forecasting and Social Change, 80*(1), 1-10.

Carlile, P. R. (2002). A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organisational Science, 13*(4), 442-455.

Carlile, P. R. (2004). Transferring, translating, and transforming: An integrative framework for managing knowledge across boundaries. *Organisation Science, 15*(5), 555-568.

Casson, M. (2004). The future of the UK railway system: Michael Brooke's vision. *International Business Review, 13*(2), 181-214.

Chatzimouratidis, A., Theotokas, I., & Lagoudis, I. N. (2012). Decision support systems for human resource training and development. *The International Journal of Human Resource Management, 23*(4), 662-693.

Chin Jr., G., & Lansing, C. S. (2004). Capturing and supporting contexts for scientific data sharing via the biological sciences collaboratory. *Proceedings of the 2004 ACM conference on Computer supported cooperative work, 6,* pp. 409-418. New York.

CNN. (2014, May 21). *French trains 'too wide' to fit in some stations.* Retrieved March 12 , 2016, from http://edition.cnn.com/travel/article/france-trains-sncf/index.html

Coviello, N. E., & Joseph, R. M. (2012). Creating major innovations with customers: Insights from small and young technology firms. *Journal of Marketing, 76*(6), 87–104.

Crossan, M. M., Lane , H. W., & White, R. E. (1999). An organisational learning framework: from intuition to institution. *Academy of management review, 24*(3), 522-537.

Cuadra-Peralta, A. A., Veloso-Besio, C., Iribaren, J., & Pinto, R. (2017). Intervention for supervisors, based on social skills and leadership, in order to improve organisational climate perception and organisational performance outcomes. *Journal of Organisational Change Management, 30*(2), 281-292.

Dalkir, K. (2011). *Knowledge Management in Theory and Practice* (2nd ed.). Cambridge, Mass: MIT Press.

Davenport, T. H. (2014). How strategists use "big data" to support internal business decisions, discovery and production. *Strategy & Leadership, 42*(4), 45–50.

Davenport, T. H., Harris, J. G., & Kohli, A. (2001). How do they know their customers so well? *MIT Sloan Management Review, 42*(2), 63-73.

Deetz, S. (1996). Describing differences in approaches to organisation science: Rethinking Burreli and Morgan and their legacy. *Organisation Science, 7*(2), 191-207.

Denscombe, M. (2007). *The good research guide: for small-scale social research projects* (3rd ed.). Maidenhead: Open University Press.

Downe, J., Hartley, J., & Rashman, L. (2004). Evaluating the extent of inter-organisational learning and change through the Beacon Council Scheme. *Public Management Review, 6*(4), 531-553.

Duffield, S., & Whitty, J. S. (2015). Developing a systemic lessons learned knowledge model for organisational learning through projects. *International Journal of Project Management, February, 33*(2), 311-324.

Duhon, H. J., & Elias, J. S. (2008). Why it is difficult to learn lessons: Insights from decision theory and cognitive science. *Society of Petroleum Engineers, 3*(3), 1-7.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: opportunities and challenges. *Academy of management journal, 50*(1), 25-32.

Engeström, Y. (1999). Innovative learning in work teams: Analysing cycles of knowledge creation in practice. In Y. Engeström, R. Miettinen, & R. L. Punamäki (Eds.), *Perspectives on Activity Theory: Learning in doing: Social, cognitive and computational perspectives* (pp. 377-404). Cambridge: Cambridge University Press.

Engeström, Y. (2008). *From Teams to Knots: Activity-Theoretical Studies of Collaboration and Learning at Work: Learning in Doing: Social, Cognitive and Computational Perspectives.* Cambridge: Cambridge University Press.

Engeström, Y. (2015). *Learning by expanding: an activity-theoretical approach to developmental research* (2nd ed.). Cambridge: Cambridge University Press.

Engeström, Y., Engeström, R., & Kärkkäinen, M. (1995). Polycontextuality and boundary crossing in expert cognition: Learning and problem solving in complex work activities. *Learning and Instruction, 5*(4), 319-336.

Ernst, C., & Chrobot-Mason, D. (2010). *Boundary spanning leadership: Six practices for solving problems, driving knowledge creation and transforming organisations.* New York: McGraw-Hill Professional.

Ernst, C., & Chrobot-Mason, D. (2011). Flat world, hard boundaries: How to lead across them. *MIT Sloan Management Review, 52*(3), 81-88.

Faucher, J.-B. P., Everett, A. M., & Lawson, R. (2008). Reconstituting knowledge management. *Journal of Knowledge Management, 12*(3), 3-16.

Ferrin, D. L., Bligh, M. C., & Kohles, J. C. (2008). It takes two to tango: An interdependence analysis of the spiraling of perceived trustworthiness and cooperation in interpersonal and intergroup relationships. *Organisational Behavior and Human Decision Processes, 107*(2), 161-178.

Figueiredo, E., Pais, L., & Monteiro, S. (2016). Human resource management impact on knowledge management: Evidence from the Portuguese banking sector. *Journal of Service Theory and Practice, 26*(4), 497-528.

Fornell, C. (1992). A national customer satisfaction barometer: The Swedish experience. *Journal of Marketing, 55*(January), 1-21.

Freeze, R. D., & Kulkarni, U. (2007). Knowledge management capability: Defining knowledge assets. *Journal of Knowledge Management, 11*(6), 94-109.

García Pérez, A., & Ayres, R. (2009). Collaborative development of knowledge representations - A novel approach to knowledge elicitation and transfer . *Electronic Journal of Knowledge Management,, 7*(1), 55-62.

García Pérez, A., & Ayres, R. (2012). Modelling research: A collaborative approach to helping PhD students develop higher-level research skills. *European Journal of Engineering Education, 37*(3), 297-306.

Gavrilova, T., & Andreeva, T. (2012). Knowledge elicitation techniques in a knowledge management context. *Journal of Knowledge Management, 16*(4), 523-537.

Gergen, K., & Thatchenkery, T. J. (2004). Organisation science as social construction: Postmodern potentials. *The Journal of Applied Behavioural Science, 40*(2), 228-249.

Gill, J., & Johnson, P. (2010). *Research methods for managers* (4th ed.). London: SAGE.

Gregor, S., & Benbasat, I. (1999). Explanations form intelligent systems: Theoretical foundations and implications for practice. *MIS Quarterly, 23*(4), 497-530.

Gummesson, E. (1993). *Quality management in service organisations.* . New York: International Service Quality Association.

Gurteen, D. (1998). Knowledge, Creativity and Innovation. *Journal of Knowledge Management, 2*(1), 5-13.

Hartley, J., Sørensen, E., & Torfing, J. (2013). Collaborative innovation: A viable alternative to market competition and organisational entrepreneurship. *Public Administration Review, 73*(6), 821-830.

Hassan, Z. (2014). *The social labs revolution: A new approach to solving our most complex challenges.* San Francisco: Berrett-Koehler.

Hawryszkiewycz, I. (2010). *Knowledge management : Organizing knowledge based enterprises.* Basingstoke: Palgrave Macmillan.

Hicks, R. C., Dattero, R., & Galup, S. D. (2006). The five-tier knowledge management hierarchy. *Journal of Knowledge Management, 10*(1), 19-31.

Hislop, D. (2013). *Knowledge management in organisations: A critical introduction* (3rd ed.). Oxford: Oxford University Press.

Huber, G. P. (1991). Organisational learning: The contributing process and the literatures. *Organisation Science, 2*(1), 88-115.

Jakubik, M. (2008). Experiencing collaborative knowledge creation processes. *The Learning Organisation, 15*(1), 5-25.

Jaspreet, K. (2016). Impact of training and development programmes on the productivity of employees in the banks. *Journal of Strategic Human Resource Management, 5*(1), 47-53.

Jennex, M. E., Smolnik, S., & Croasdell, D. T. (2009). Towards a consensus knowledge management success definition. *VINE: The Journal of Information and Knowledge Management, 2*(174-188), 39.

Jennex, M. E., Smolnik, S., & Croasdell, D. T. (2016). The search for knowledge management success. (pp. 4202-4211). 49th Hawaii International Conference on System Sciences.

Johnson-Laird, P. N. (1983). *Mental models: Towards a cognitive science of language, inference and consciousness.* Cambridge: Harvard University Press.

Jones, L., & Somekh, B. (2011). Observation. In B. Somekh, & C. Lewin (Eds.), *Theory and methods in social research* (2nd ed., pp. 131-138). London: SAGE.

Joshi, H., Farooquie, J. A., & Chawla, D. (2016). Use of knowledge management for competitive advantage: The case study of Max Life Insurance. *Global Business Review, 17*(2), 450-469.

Junker, B. H. (1960). *Fieldwork.* Chicago: University of Chicago Press.

Jurisica, I., Mylopoulos, J., & Yu, E. (2004). Ontologies for knowledge management: An information systems perspective. *Knowledge and Information Systems, 6*(4), 380–401.

Kang, Y., Lee, J., & Kim, H.-W. (2017). A psychological empowerment approach to online knowledge sharing. *Computers in Human Behavior, 74*(September), 175-187.

Katzenbach, J. R., & Smith, D. K. (2001). *The discipline of teams: A Mindbook-Workbook for delivering small group performance.* Toronto: John Wiley and Sons.

Kerlinger, F. N. (1986). *Foundations of behavioural research* (3rd ed.). New York: Holt, Rinehart and Winston.

Khvatova, T., & Block, M. (2017). Exploring the role of task-related trust in intra-organisational knowledge sharing. *The International Journal of Human Resource Management, 28*(2), 333-355.

Kim, H. T., Lee, J.-N., Chun, U. J., & Benbasa, I. (2014). Understanding the effect of knowledge management strategies on knowledge management performance: A contingency perspective. *Information & Management, 51*(4), 398-416.

Kirkpatrick, D. L., & Kirkpatrick, J. D. (2006). *Evaluating training programs: The four levels* (3rd ed.). United States: Berrett-Koehler Publishers.

La, K. V., & Kandampully, J. (2004). Market oriented learning and customer value enhancement through service recovery management. *Managing Service Quality, 14*(5), 390-401.

Laal, M. (2013). Collaborative learning; Elements. *Procedia - Social and Behavioural Sciences, 83*, 814-818.

Laal, M., & Laal, M. (2012). Collaborative learning: What is it? . *Procedia - Social and Behavioral, 31*, 491-495.

Lamont, S., Brunero, S., & Russell, R. (2010). An exploratory evaluation of an action learning set within a mental health service. *Nurse Education in Practice, 10*(5), 298-302.

Levin, D. Z., & Cross, R. (2004). The strength of weak ties you can trust: The mediating role of trust in effective knowledge transfer. *Management Science, 50*(11), 1477-1490.

Levinson, N. S., & Asahi, M. (1995). Cross-national alliances and inter-organisational learning. *Organisational Dynamics, 24*(2), 50-63.

Lichtman, M. (2014). *Qualitative research for the social sciences.* Thousand Oaks, CA: SAGE.

Lumsden, G., Lumsden, D., & Wiethoff, C. (2010). *Communicating in groups and teams: Sharing leadership.* Boston, Mass: Wadsworth Cengage Learning.

Mains, I., & MacLean, S. (2017). Developing across boundaries – mentor and mentee perceptions and experiences of cross-organisational mentoring. *Industrial and Commercial Training, 49*(4), 189-198.

Marsick, V. J., & Maltbia, T. E. (2009). The transformative potential of action learning conversations: Developing critically reflective practice skills. In J. Mezirow, & E. W. Taylor (Eds.), *Transformative learning in practice: Insights from community, workplace and higher education* (pp. 160-171). New York, NY: Wiley.

Mccartney, S., & Stittle, J. (2012). Engines of extravagance: The privatised British railway rolling stock industry. *Critical Perspectives on Accounting, 23*(2), 153-167.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). London: Thousand Oaks: SAGE.

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). London: SAGE.

Miller, J., Craighead, C., & Karwan, K. (2000). Service recovery: A framework and empirical investigation. *Journal of Operations Management, 18*(4), 387-400.

Morris, P. (2013). Reconstructing project management reprised: A knowledge perspective. *Project Management Journal, 44*(5), 6-23.

Myers, M. D. (2013). *Qualitative research in business and management* (2nd ed.). London: SAGE.

Newman, V. (1997). Redefining knowledge management to deliver competitive advantage. *Journal of Knowledge Management, 1*(2), 123-128.

Nonaka, I. (1991). The knowledge-creating company. *Harvard Business Review, 69*(6), 96-104.

Nonaka, I. (1994). A dynamic theory of organisational knowledge creation. *Organisation Science, 5*(1), 14-37.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation.* Oxford: Oxford University Press.

Nonaka, I., Konno, N., & Toyama, R. (2001). A conceptual framework for the continuous and self-transcending process of knowledge creation. In I. Nonaka, & T. Nishigushi (Eds.), *Knowledge Emergence: Social, technical and evolutionary dimensions of knowledge creation* (pp. 3-29). Oxford: Oxford University Press.

Norman, D. A. (2014). Some observations on mental models. In D. Gentner, & A. L. Stevens (Eds.), *Mental Models.* New York; London: Psychology Press.

O'Neil, J., & Marsick, V. J. (2007). *Understanding action learning.* New York, NY: AMACOM.

O'Brien, M. (2012). Knowledge transfer resulting from the improving educational outcomes for children in care conference: How it is helping a child welfare organisation to build a long term educational strategy. *Children and Youth Services Review, 34*(6), 1150-1153.

Oliver, C. (1997). Sustainable competitive advantages: Combining institutional and resources-based view. *Strategic Management Journal, 18*(9), 697-713.

O'Neil, J., & Marsick, V. J. (2014). Action learning coaching. *Advances in Developing Human Resources, 16*(2), 202-221.

Orlitzky, M., Siegel, D., & Waldman, D. (2011). Strategic corporate social responsibility and environmental sustainability. *Business and Society*, *50*(1), 6-27.

Peschl, M. F., & Fundneider, T. (2014). Designing and enabling spaces for collaborative knowledge creation and innovation: From managing to enabling knowledge creation as socioe-pistemological technology. *Computers in Human Behaviour, 37*(August), 346–359.

Polanyi, M. (1962). *Personal knowledge: Towards a post-critical philosophy.* London: Routledge.

Popper, K. R. (1979). *Objective knowledge: An evolutionary approach. Oxford : Oxford.* Oxford: Oxford University Press.

Porter, M. (1998). Clusters and the new economics of competition. *Harvard Business Review, 76*(6), 77-90.

Pöyhönen, A., & Smedlund, A. (2004). Assessing intellectual capital creation in regional clusters. *Journal of Intellectual Capital, 5*(3), 351-365.

Prahalad, C. K., & Ramaswamy, V. (2004). *The future of competition: Co-creating unique value with customers.* Boston: Harvard Business School Press.

Pranis, K. (2014). *Little Book of Circle Processes: A New/Old approach to peace-making.* New York: Skyhorse .

Reid, F. (2003). Creating a knowledge sharing culture among diverse business units. *Employment Relations Today, 30*(3), 43-49.

Rimanoczy, I., & Turner, E. (2008). *Action reflection learning: Solving real business problems by connecting learning with earning. Mountain View.* CA: Davies Black.

Roeder, T. (2013). *Managing project stakeholders building a foundation to achieve project goals.* Somerset, NJ: John Wiley & Sons.

Saldaña, J. (2015). *The coding manual for qualitative researchers* (3rd ed.). Los Angeles, CA ; London: SAGE.

Salisbury, M. (2008). A framework for collaborative knowledge creation. *Knowledge Management Research and Practice, 6*(3), 214-224.

Scardamalia, M., & Bereiter, C. (1994). Computer support for knowledge-building communities. *The Journal of the Learning Sciences, 3*(3), 265-283.

Scardamalia, M., & Bereiter, C. (2010). A brief history of knowledge building. *Canadian Journal of Learning and Technology, 36*(1), 1-16.

Scardamalia, M., & Bereiter, C. (2014). Knowledge building and knowledge creation: One concept, two hills to climb. In S. Chee, T. Hyo, J. So, & J. Yeo (Eds.), *Knowledge creation in education* (pp. 35-52). Dordrecht: Springer.

Scardamalia, M., Carl, B., & Lamon, M. (1994). The CSILE project: Trying to bring the classroom into World 3. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 201-228). Cambridge: MIT Press.

Scharmer, O. C. (2008). Uncovering the blind spot of leadership. *Leader to Leader, 47*(Winter), 52-59.

Schilke, O., & Cook, K. S. (2013). A cross-level process theory of trust development in inter-organisational relationships. *Strategic Organisation, 11*(3), 281–303.

Schneider, P. (2005). The future of competition: Co-creating unique value with customers. (P. G. Lantos, Ed.) *The Journal of Product and Brand Management, 14*(4/5), 348.

Schultze, U., & Leidner, D. E. (2002). Studying knowledge management in information systems research: Discourses and theoretical assumptions. *MIS Quarterly, 26*(3), 213-242.

Schwarz, R. (2000). Comments on facilitator competencies: Roger M. Schwarz. *Group Facilitation: A Research and Application Journal, 2*(2), 33-34.

Schwarz, R. (2002). *The skilled facilitator: A comprehensive resource for consultants, facilitators, managers, trainers, and coaches* (2nd ed.). San Francisco: Jossey_Bass.

Schwarz, R. (2014). How well does your leadership team really work? *Leader to Leader , 71*(Winter), 54-59.

Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher, 27*(2), 4-13.

Sieber, J. E. (1992). *Planning ethically responsible research: A guide for students and internal review boards* (Vol. 31). Newbury Park, CA: SAGE.

Siekman, P. (2001). ‚Seagate's Three-Day Revolution: In an intensive session, 80 carefully chosen employees laid the groundwork for the company's return to financial health. *Fortune, 143*(4), 210-212.

Silverman, D. (2013). *Doing Qualitative Research: A practical handbook* (4th ed.). London: SAGE.

Spencer, L., Ritchie, J., Connor, W. O., Morrell, G., & Ormston, R. (2014). Analysis in practice. In J. Ritchie, J. Lewis, C. McNaughton Nicholls, & R. Ormston (Eds.), *Qualitative research practice: A guide for social science students and researchers* (2nd ed.). London: SAGE.

Spender, J.-C., & Grant, R. M. (1996). Knowledge and the firm: Overview. *Strategic Management Journal, 17*(Winter), 5-9.

Stahl, G., Koschmann, T., & Suthers, D. D. (2006). Computer-supported collaborative learning: An historical perspective. In K. R. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (pp. 409-426). Cambridge: Cambridge University Press.

Stamper, C. L., & Johlke, M. C. (2003). The impact of perceived organisational support on the relationship between boundary spanner role stress and work outcomes. *Journal of Management, 29*(4), 569–588.

Szulanski, G. (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal, 17*, 27-43.

Tax, S. S., & Brown, S. W. (1998). Recovering and learning from service failure. *Sloan Management Review, 40*(1), 75-88.

Teece, D. J. (2000). Strategies for managing knowledge assets: The role of firm structure and industrial context. *Long Range Planning, 33*(1), 35-54.

Thursfield, D. (2015). Resistance to team working in a UK research and development laboratory Work. *Employment & Society, 29*(6), 989-1006.

Torfing, J., Peters, B. G., Pierre, J., & Sørensen, E. (2012). *Interactive governance advancing the paradigm.* Oxford: Oxford University Press.

Tsui, A. S., Porter, L. W., & Egan, T. D. (2002). When both similarities and dissimilarities matter: Extending the concept of relational demography. *Human Relations, 55*(8), 899–929.

Twigg, J., & Steiner, D. (2002). Mainstreaming disaster mitigation: Challenges to organisational learning in NGOs. *Development in Practice, 12*(3/4), 473-479.

Vanneste, B. S., Puranam, P., & Kretschmer, T. (2014). Trust over time in exchange relationships: Meta-analysis and theory. *Strategic Management Journal, 35*(12), 1891-1902.

Wang, Y., & Lo, H.-P. (2003). Customer-focused performance and the dynamic model for competence building and leveraging: A resource-based view. *Journal of Management Development, 22*(6), 483-526.

Weber, M. (1947). *The theory of social and economic organisation.* (T. Parsons, Ed., A. M. Henderson, & T. Parsons, Trans.) New York: The free press.

Wijnhoven, F. (2006). Knowledge management: More than a buzzword. In A. Jetter, J. Kraaijenbrink, H.-H. Schröder, & F. Wijnhoven (Eds.), *Knowledge integration : the practice of knowledge management in small and medium enterprises* (pp. 1-17). Heidelberg; New York: Physica-Verlag.

Yin, R. K. (2012). *Applications of case study research* (3rd ed.). Los Angeles, Calif; London: SAGE.

Yin, R. K. (2014). *Case study research: design and methods* (5th ed.). Los Angeles: SAGE.

Appendix A

Primary data collected during CMSorg and BRS collaborative projects

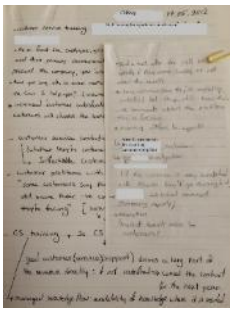
A1. CMSorg – Original data collected

A1.1. Project initiation

A1.1.1. Summary of the communications between initial members of CKC team

Participants	Event	Type	Result
- The researcher - KET research expert from CU - CMSorg representative (Expert from Strategy, Customer Insight and Assurance Team)	Overview of the CMSorg problem about high level of customer complaints	Discussions	Understanding the problem and clarifying knowledge domain
- The researcher - KET research expert from CU - CU research team representative	Reviewing of research opportunities	- Discussions - E-mails	Identefying available and right researchers
From CU: - The researcher - KET research expert from - Research team representative From CMSorg: - CMSorg representative - Customer service expert - Data analyst expert	Reviewing of CMSorg problem about high level of customer complaints Reviewing CMSorg previous attmepts to solve the problem	- Introductory meeting - The researcher's observation	Indentyfing the complexity of the problem Developing draft project proposal The researcher's field note about the complication of the interaction between the participants
- The researcher - KET research expert from CU - CMSorg representative	Share and review of draft project proposals	- E-mails	Agreeing on the benefits of the project for CU research team and CMSorg
- The researcher - KET research expert from CU	Developing project proposal	- Discssiosns - E-mails	Final project proposal
- The researcher - KET research expert from CU - CMSorg representative	Reviewing final project proposal	- Discssiosns - E-mails	Identifying the required data and knowledge resources Verifying access to required data and knowledge resources

A1.1.2. Sample of field notes during meetings and discussions



A1.1.3. Samples of e-mail Communications

From: CU research team
Sent: 22 May 2012 12:37
To: CMSorg representative
Cc: CU research team
Subject: Coventry University Project - Proposals

Dear

Following our meeting two weeks ago there are now three project proposals that I would like to share for your consideration. These are:

- A step towards understanding Customer Service at Severn Trent Water: Knowledge-related issues. Researcher: Melisa Jahantab.
This project seeks to analyse a sample of the data already available, in particular the interaction between customer service staff and customers, in order to try to identify any issues specifically related to information and knowledge resources. The project will investigate, for example, the nature and relationships between information resources requested by customers and information resources provided by staff.

- A study of the potential relationship between the use of Researcher:
This project seeks to analyse a section of the data available in an attempt to understand if there is any relationship between the billing system being used by a customer and their levels of satisfaction, and provide recommendations based on the findings of the investigation.

From: CMSorg representative
Sent: 23 May 2012 13:43
To:
Cc: Research team from CU
Subject: RE: Coventry University Project - Proposals

Afternoon

Thank you for sending those through

I think both of the post graduate projects sound good on the face of it. I guess the next step is to add a bit more detail in to the methodologies, tools and techniques that will be used to create the project deliverables.

As a next step, if we could get some more detail in to the methodologies, tools and techniques that will be used we can then get together to discuss the projects in a little more detail.

Kind Regards,

Business Improvement Analyst
Customer Relations
Strategy, Customer Insight and Assurance Team

From: CU research team
Sent: 31 May 2012 07:50
To: CMSorg representative
Subject: Coventry University Project - Proposals

Dear

We now have an updated version of the project proposals which include an outline - in general terms, of the way research will be conducted. Please find these attached.

From: CU research team
Sent: 31 May 2012 07:50
To: CMSorg representative
Subject: Coventry University Project - Proposals

Dear

We now have an updated version of the project proposals which include an outline - in general terms, of the way research will be conducted. Please find these attached.

A1.2. Project preparation

A1.2.1. Sample of customer experience with CMSorg in form of qualitative text

ISSUE_RESOLVED	COMMENTS
n	there were problems with the line which necessitated me calling three times .unfortunately unable to speak to the same person each time and so had to repeat everything every time i called wasting a lot of time before my issue was resolved
n	the advisor was rude and patronising and was n't interested in my query in addition to there seeming to be a lack of communication within the company .you might consider retraining staff in relation to customer service and sharing info .
n	i am dissatisfied as having informed you of r i was frustrated to not only receive a bill accounting for my previous ut also that you have not registered my new his has been a waste of time and phone calls .i shall contact the new owner also as i am sure they would have updated you independently of myself .
y	could be a bit more helpful .
n	response and information is there but you guys are not ready to go an extra length if a customer is requesting something .
y	customer service gave me the wrong number to call-for appts-this resulted in two phone calls and unnecessary waiting in a queue
n	as students , we felt we were not accommodated for very well
n	i was told in september that my as on a fixed rate and would be the same , when i received the bill it was for a lot more .your operator could not explain the discrepancy or pass me on to anyone who could and was very unhelpful .
n	All departments need to communicate with each other . Would be better for to keep me updated about my issue and not rely on me to chase different departments . Reminder letters should n't be sent when an account is on hold .
n	i was told prior to having contact from another staff member that if i got a would be cheaper so i got a letter from my agree to this to find out later it probably not cheaper which seems back to front
y	our was faulty but we were told it was not .it took our getting in touch to get the replaced .
n	Ask during the phone call if they would like to participate in the text question survey .
n	when i provided my number i specifically asked what the number was provided for and was assured that this was only in the event that you needed to contact me regarding the .already a matter of hours after the call i am receiving surveys etc . please can you ensure that i am not contacted again for such matters .this aside service offered today was excellent .
n	i asked for my payment plan to be set up from may to april to lower my weekly payments but they never did that .
n	I asked information on how to be more nd she did n't give me any useful advice like that i received with e-on .i was told to just go on the internet

A1.2.2. CMSorg – Original data collected > project preparation > sample of customer service expert from operation department accepting to participate

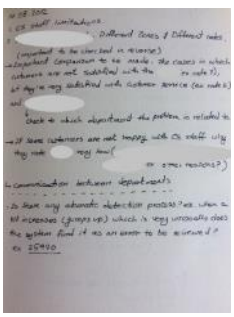
From: Customer service expert from operation department
Sent: 29 August 2012 13:07
To: CMSorg representative
Cc: Expert's colleagues
Subject: RE: Cov Uni Students

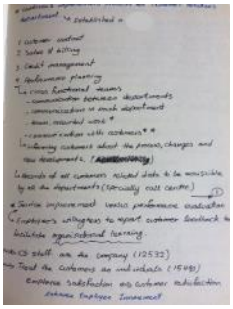
Hello

Yes, all good this end. I'll meet them both at 10am downstairs. I understand that the plan is to give them an overview of in general and to spend time with the caseworkers. Is there anything else specific?

Thanks,

A1.2.3. Samples of field notes during meetings and discussions





A1.3. Collaborative knowledge creation

A1.3.1. Staff training – Confirmation email and samples of field notes

Exhibit 1. Confirmation e-mail

Staff training Inbox x

CMSorg representative 9/13/12

to The researcher and the research team

Morning

I have firmed up a training session that you can sit in on.

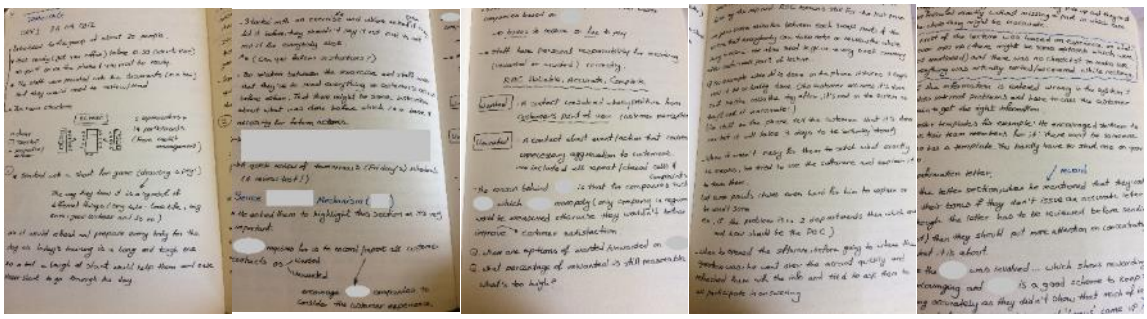
It is on Wednesday 26th Sept from 9 – 5, so please note this in your diaries.

For a bit of context, the agent training is conducted over a 4 week period covering various aspects of the role. I have booked you in on the day that I think would be most useful to you, which teaches the agents about how to talk to customers and what customer experience measures they use.

Kind Regards,

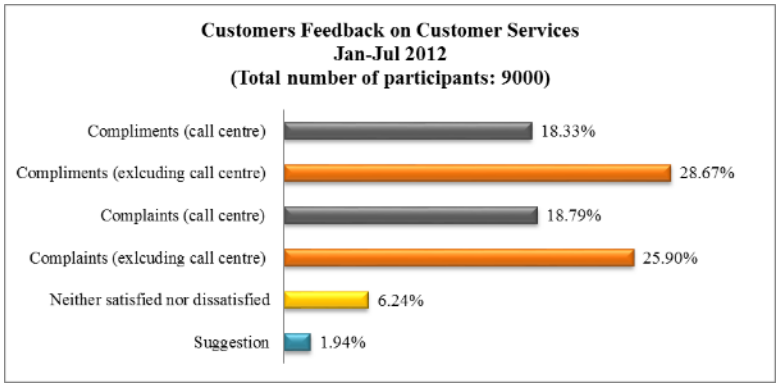
Business Improvement Analyst
Customer Relations
Customer Insight and Assurance Team

Exhibit 2. Samples of field notes

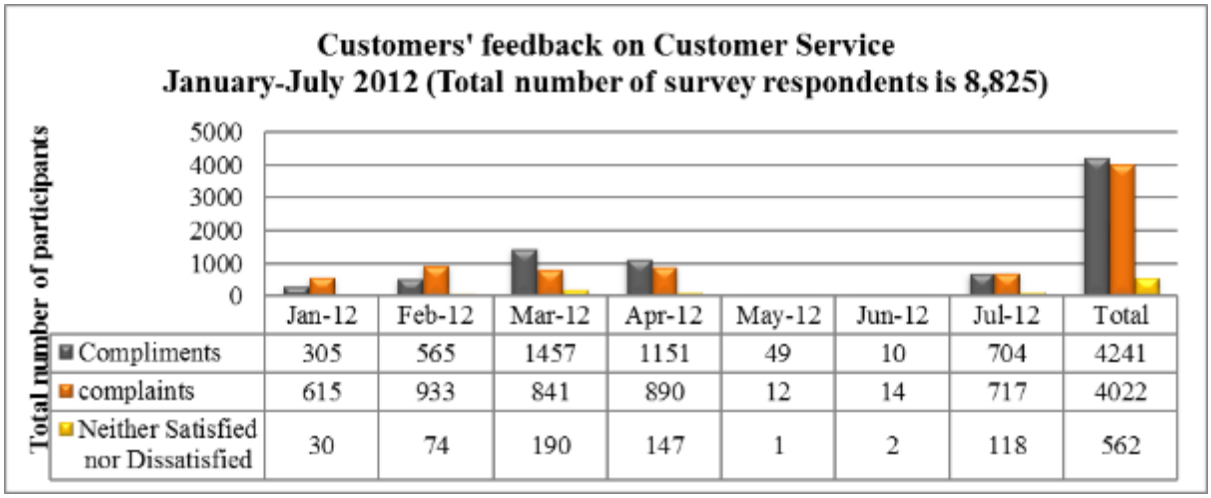


A1.3.2. Displays of data collected from CMSorg customers

Display 1. Levels of comments in each category

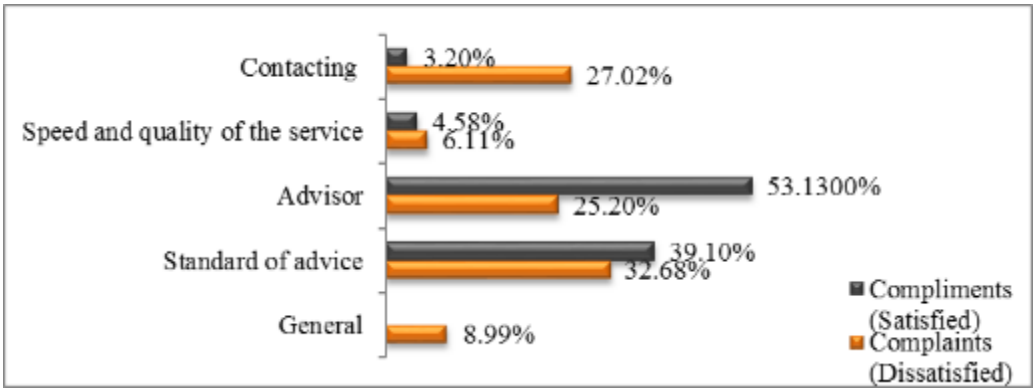


Display 2. Main categories of customers' comments excluding 175 Suggestions

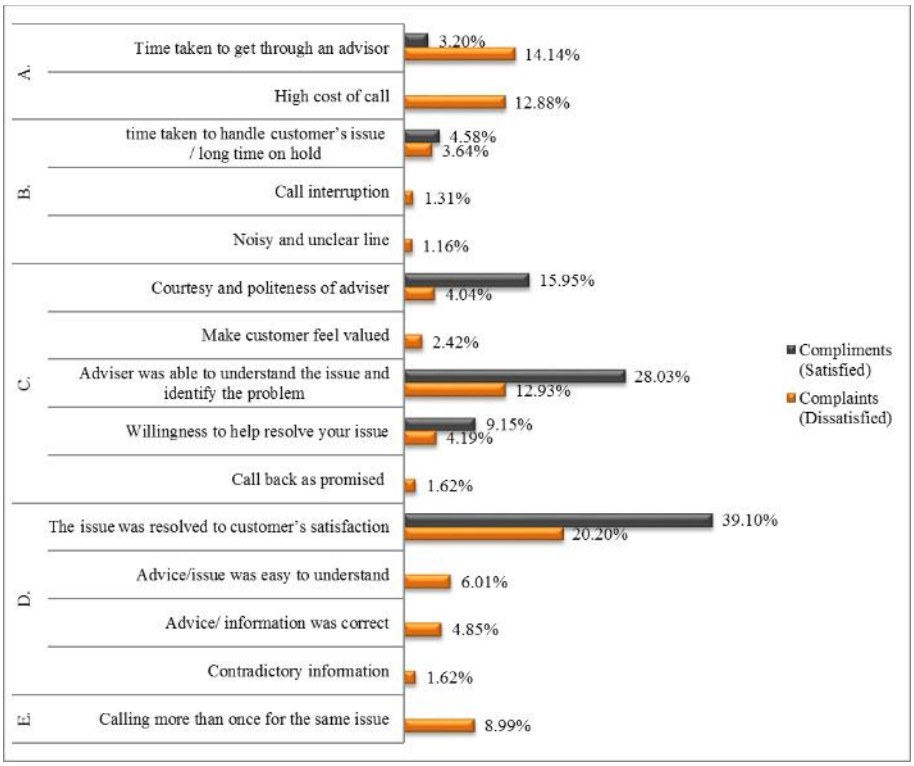


	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Total
Compliments	305	565	1457	1151	49	10	704	4241
complaints	615	933	841	890	12	14	717	4022
Neither Satisfied nor Dissatisfied	30	74	190	147	1	2	118	562

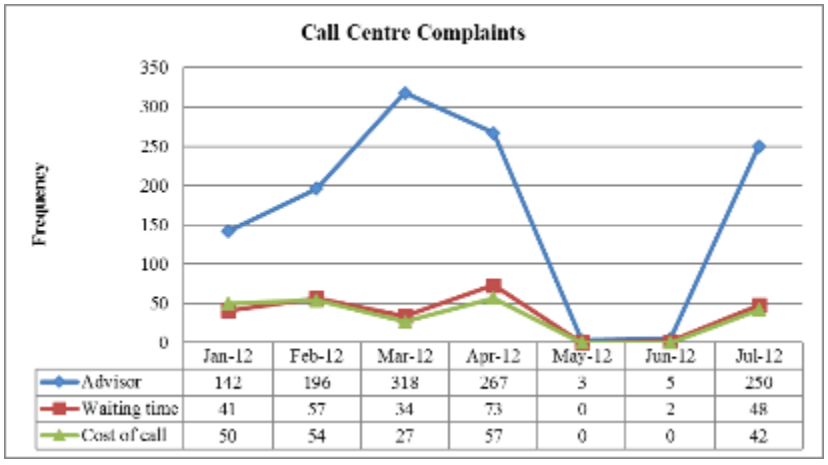
Display 3. Compliments and complaints about call centre



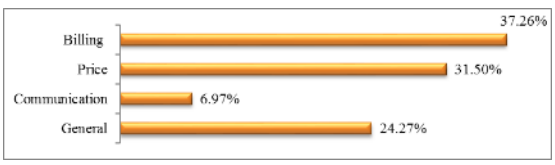
Display 4. Breakdown of compliments and comments about call centre



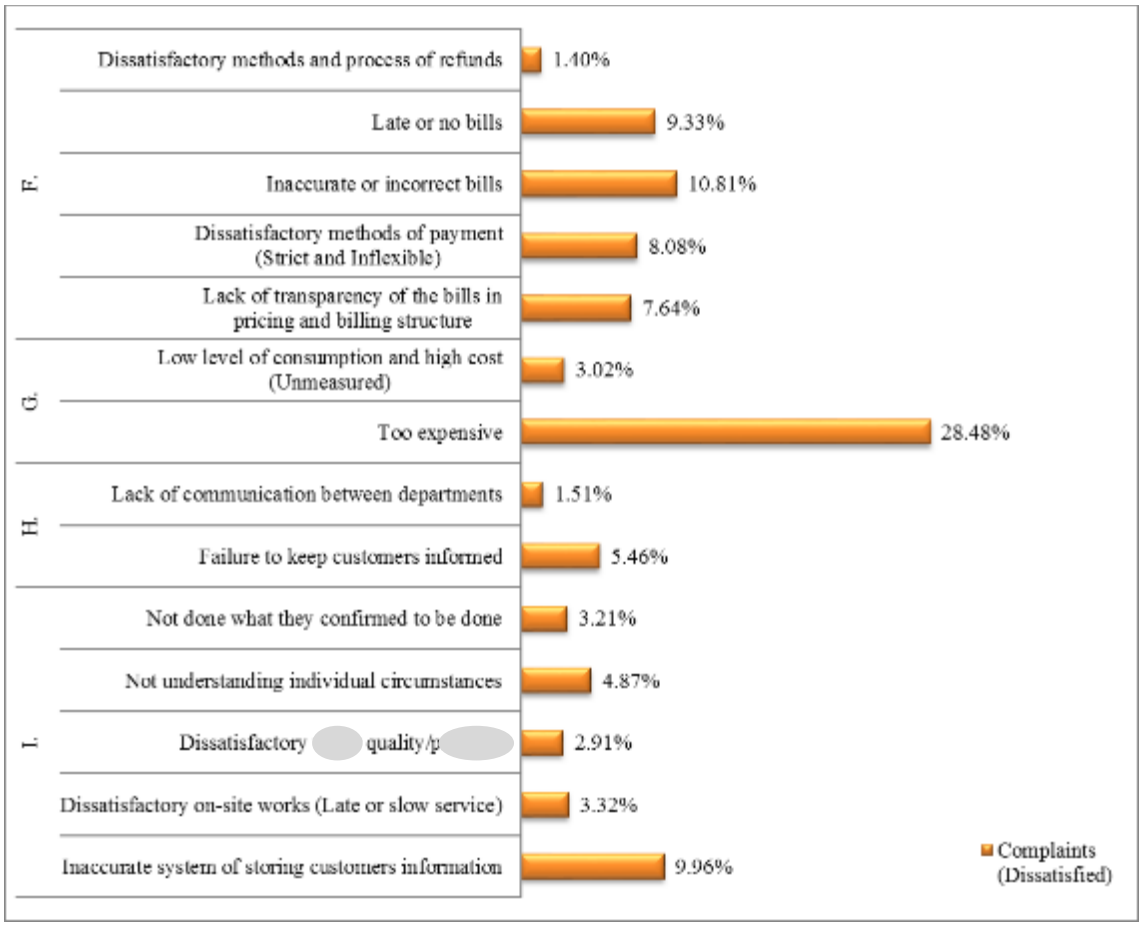
Display 5. The relationship between the complaints about the advisor, waiting time and cost of call



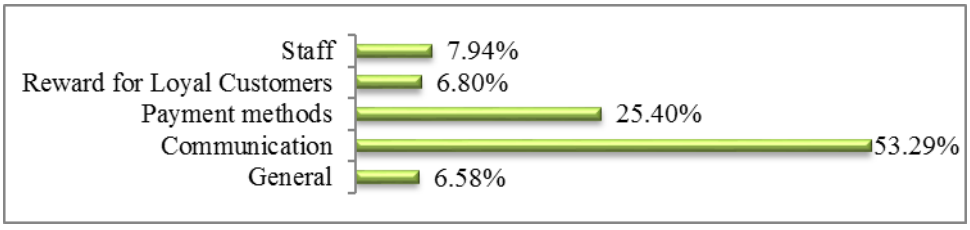
Display 6. Level of Complaints – Excluding call Centre



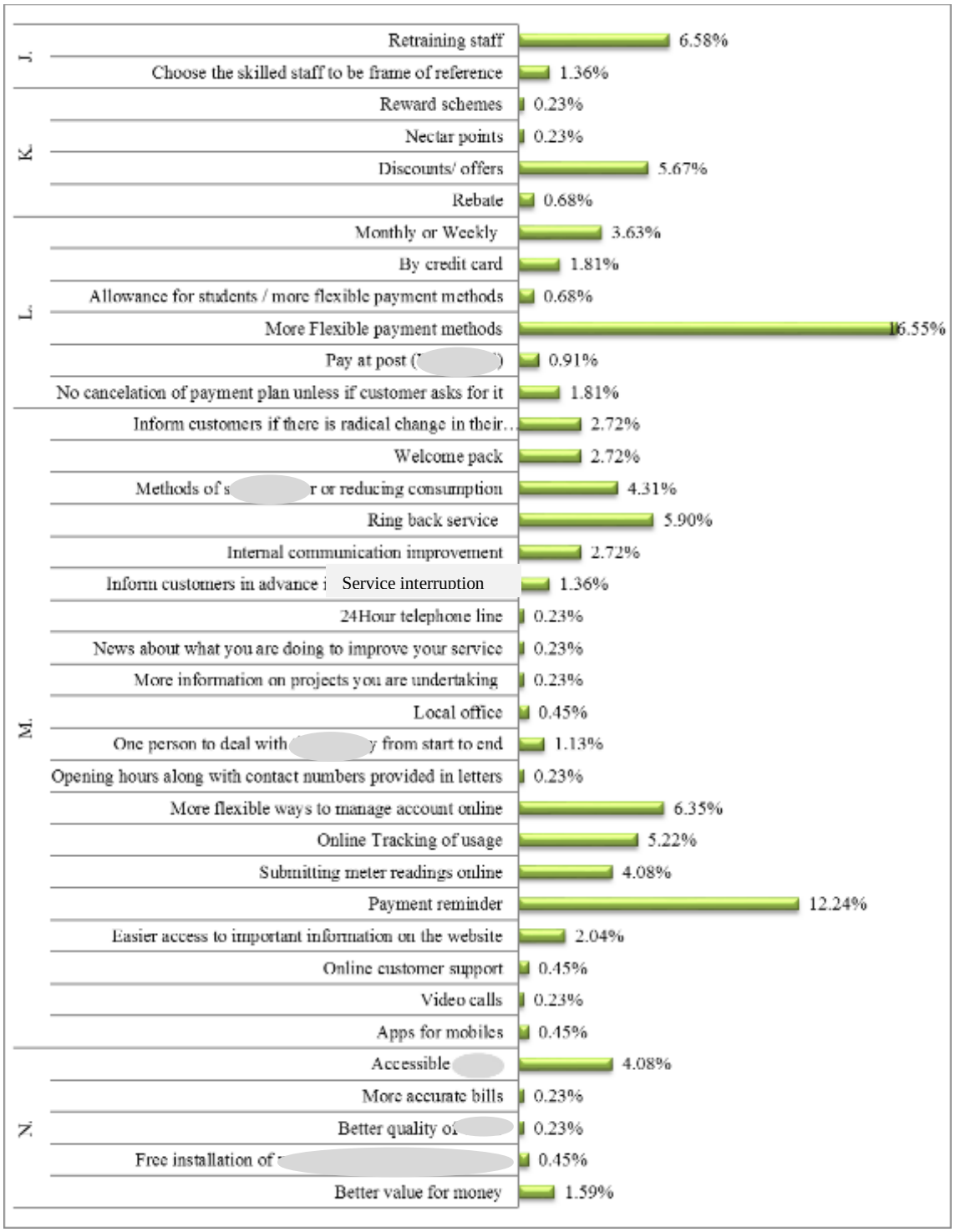
Display 7. Breakdown of Complaints – Excluding Call Centre



Display 8. Levels of Suggestions



Display 9. Breakdown of Suggestions



A1.3.3. A summary of the participants input meetings

Participants	**Event**	**Type**	**Result**
- The researcher - Experts from Strategy, Customer Insight and Assurance Team	Review of the factors influencing poor transfer of problem-centred experience between call centre staff and CMSorg	Open-ended interviews	Identifying the general factors that might lead to specific customer negative experience which would result in customer complaint or general dissatisfaction with this service organisation
- The researcher - Customer service expert from billing and credit department	Staff training	The researcher's observation	Identifying specific factors that leads to poor quality of services provided at call centres
- The researcher - Customer service expert from operation department	Review of the factors influencing poor transfer of problem-centred experience between call centre staff who are responsible to record accurate details of customer complaint where further support is required	- Disscusion - The researcher's observation	Identifying specific factors that leads to poor quality of services provided by call centre staff
- The researcher - Customer service expert from operation department - Customer service expert from general inguiries department	Review of the factors influencing lack of effective communication between customers and call centre staff Review of the factors influencing lack of effective communication between call centre employees Review of the factors influencing lack of accurate skills and experience of call centre staff	Open-ended interviews	

A1.4. Review and reflect

A1.4.1. Summary of the review and reflect meetings

Participants	Event	Type	Result
- The researcher - Available customer service experts who participated in previous stage of the project	Review of the issues identified in previous stage	Review and reflect discussion	More issues related to lack of effective knowledge transfer between different groups were added to the previous findings
- The researcher - CMSorg representative	Assessment of the value of the data collected for the CMSorg project report	- Two review meetings - Few e-mails	Positive feedback – no change required
- The researcher - CMSorg representative - The KET research expert	Disscusion about the need for sentiment analysis	- One review meeting - Two reflect meetings	Computational analysis of sentiments could not add any benift to identifying root causes of customer dissatisfaction, therefore it was not considered addressed. However, detailed categorizing of custmer experience by researcher (for a very high number of customer opinions that was exactly 9,000) was further put into sentiment categories to partially address this requirement. After receiving the outcome of the data collection through the researcher's approach, CMRsorg found this analysis very accurate and more reliable than computational one. In terms of problem-solving.
- The researcher - KET research expert (Research supervisor)	Feedback of the value (clarity and readiability) of the report received from academic participant	One review meeting Few e-mails	Writing the report in non-academic language that be easy for the participants with diverse characteristics to understand the content

A1.4.2. Sample of added text to the CMSorg project report

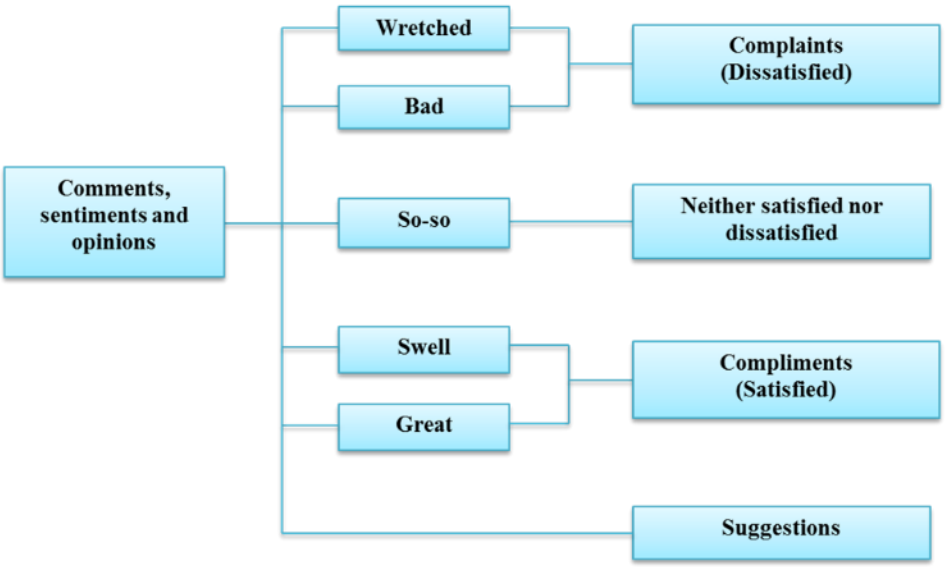
First, five main categories of sentiments were defined as followings:

1. **Wretched**: purely negative overall feelings or only slightly positive. For the service, some of the comments are: *'awful service,* or *'the service is disgraceful'* (e.g., *'no competition otherwise i would have switched to another supplier'*)
2. **Bad**: mainly negative phrases and words, with a disappointed tone. There may be a few positive statements, but the negative feelings outweigh the positive ones (e.g., *answered my questions but very unhappy about the ridiculous position of the meter*)
3. **So-so**: average or balanced sentiment. The positive and negative statements seem to balance each other or it is neither positive nor negative overall. Even if there are more negative phrases, the positive ones use a stronger language than the negative ones (e.g., *was happy with service , but i called because got unexpected bill cos direct debit wasnt set up properly .usually massive wait on stw phone line', the service is ok, my enquiry was easy to deal with* only *giving the meter reading'*)
4. **Swell**: mainly positive terms, such as good or nice. There may be some negative phrases; however, the positive ones are stronger and outweigh the negative ones (e.g. *i received a letter with incorrect information which annoyed me but the advisor i spoke to was great , she sorted it all out for me and i was very happy with the outcome*)
5. **Great**: Purely positive in tone and wording in expressing strong affirmative feelings with no complaints. It may have the smallest negative word, but has mostly great-sounding phrases. For the service, some of the comments are: '*extremely satissfaied*' or '*professional/excellent service*' (e.g. *Keep up the good work employ more people with the same attributes as ... who 's customer service skills were excellent*).

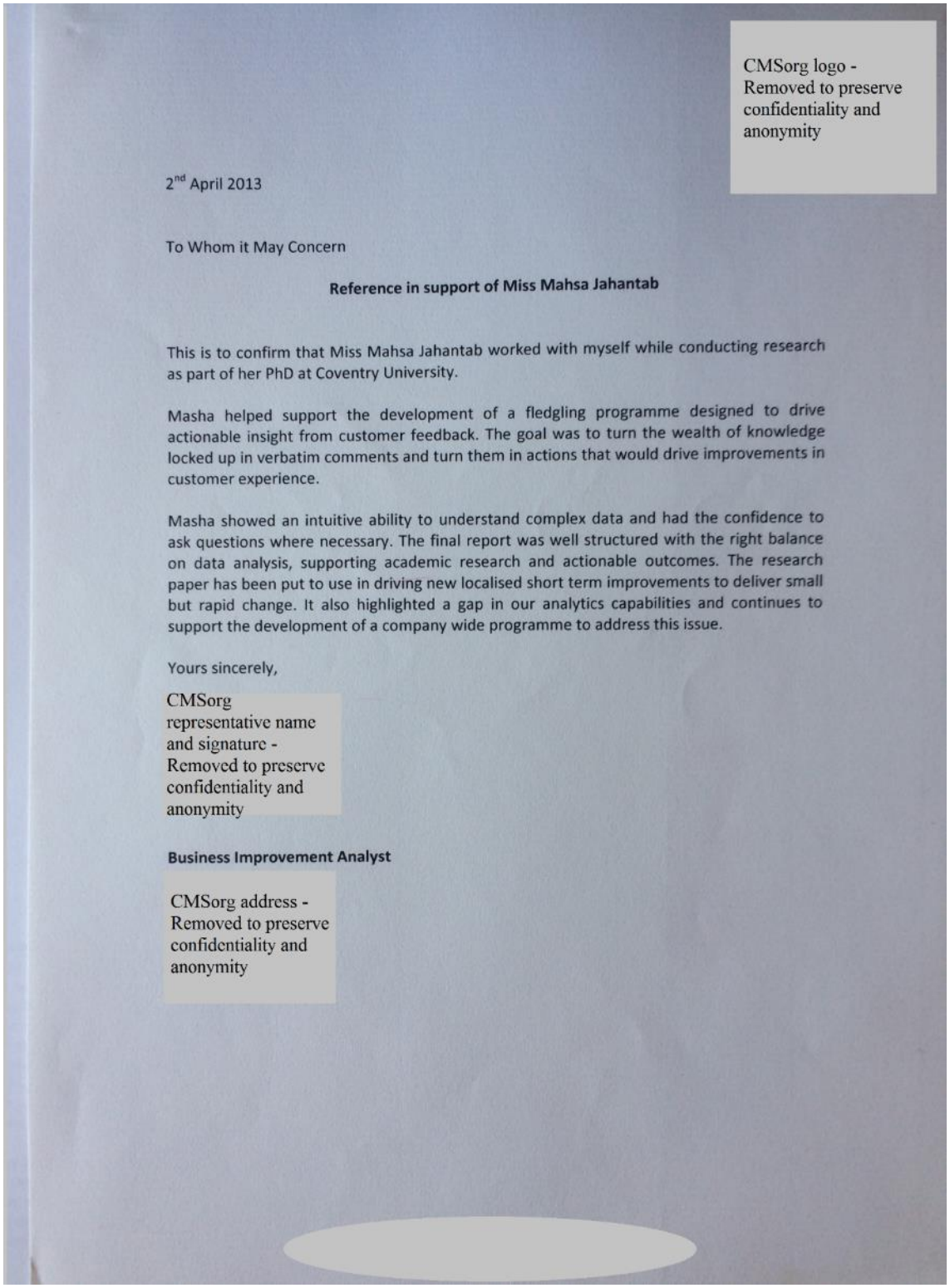
Second, four main categories of comments, sentiments and opinions were defined (the outline is shown in Figure 1):

1. **Compliments** (Great or Swell; respondents were satisfied with the service and expressed their feelings with mostly positive words),
2. **Complaints** (Wretched or bad; respondents were dissatisfied with the service and expressed their feelings with mostly negative words or disappointed tone)
3. **Neither satisfied nor dissatisfied** (so-so; respondents were neither satisfied nor dissatisfied and expressed their feelings with positive and negative words), and
4. **Suggestion**.

A1.4.3. Sample of added figures to the CMSorg project report



A1.5. Confirmation of the successful application of the proposed new approach to CKC at CMSorg by the CMSorg representative



CMSorg logo - Removed to preserve confidentiality and anonymity

2nd April 2013

To Whom it May Concern

Reference in support of Miss Mahsa Jahantab

This is to confirm that Miss Mahsa Jahantab worked with myself while conducting research as part of her PhD at Coventry University.

Masha helped support the development of a fledgling programme designed to drive actionable insight from customer feedback. The goal was to turn the wealth of knowledge locked up in verbatim comments and turn them in actions that would drive improvements in customer experience.

Masha showed an intuitive ability to understand complex data and had the confidence to ask questions where necessary. The final report was well structured with the right balance on data analysis, supporting academic research and actionable outcomes. The research paper has been put to use in driving new localised short term improvements to deliver small but rapid change. It also highlighted a gap in our analytics capabilities and continues to support the development of a company wide programme to address this issue.

Yours sincerely,

CMSorg representative name and signature - Removed to preserve confidentiality and anonymity

Business Improvement Analyst

CMSorg address - Removed to preserve confidentiality and anonymity

A2. BRS – Original data collected

A2.1. Project initiation

A2.1.1. Summary of communications between the members of CKC team

Participants	Event	Type	Results
- The researcher - KET research expert - Research and software-design expert - BRS representatives	Initial communication between the members of CU research team	- Discussions - Review meetings - E-mails	Identifying the BRS problem Clarifying the purpose of the CKC project
- The researcher - KET research expert - Research and software-design expert - BRS representatives	Developing and improving project proposal	- Review meetings - E-mails	First draft of project proposal
- The researcher - KET research expert - Research and software-design expert	Preparing the final draft of the project proposal	- E-mails	Final draft of the project proposal
- KET research expert - BRS representatives	Reviewing the project proposal	- Review meeting	Agreement between the CU and BRS Identified project duration
- The researcher - KET research expert - Research and software-design expert - BRS representatives	Understanding the UK rail industry, its structure etc. Identifying the key digital resources within the industry with a view to create information	- Discussions - Review meetings - E-mails	Identifying potential stakeholder groups Identifying data sources from different stakeholder groups

A2.2. Project preparation

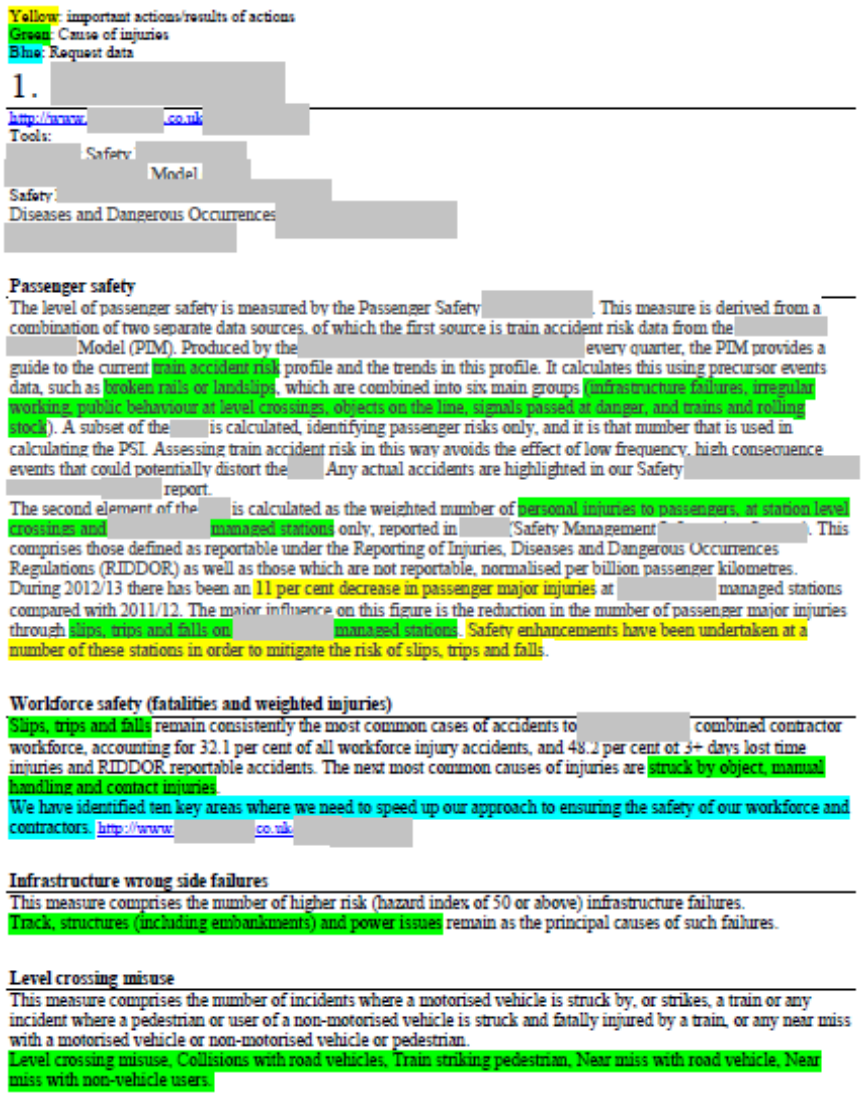
A2.2.1. Summary of communications between members of CKC team and potential participants

Participants	Event	Type	Results
- The researcher - KET research expert - Research and software-design expert - BRS representatives	Checking for available and accessible rail-safety related resources Identify individuals with problem-centred knowledge	- Discussions - Telephone conversations (The key notes were sent to CKC team in text format) - E-mails	Identifying available data sources from different stakeholder groups Identifying experts from potential stakeholder groups Selecting experts with rail-safety related knowledge
- The researcher - KET research expert - Research and software-design experts	Review of documentary evidence	- Discussions - E-mails	The basic safety models
- BRS representatives - Potential participants	Introducing the CKC project aim and the members of the research team from CU to selected experts (Potential participants) Confirmation of interest in engaging in CKC	- Telephone conversations - E-mails	Identifying the experts from rail related organisation with rail-safety related knowledge who are willing to participate in CKC
- The researcher - KET research expert - Research and software-design experts - Experts from participating organisations	Introducing the objectives of the projects Identifying the available individuals and accessible data resources within their organisations Explaining the benefits of the safety-related data and individuals' experience for the success of this project	- Telephone conversations (The key notes were sent to CKC team in text format) - E-mails	Confirming the experts who are willing to participate in CKC New data and information Safety model development
- The researcher - KET research expert - Research and software-design expert	Selecting and reserving dates and location the CKC meetings in form of design-shop	Discussions E-mails	Developing the design-shop agenda Planning the stakeholder invite

A2.2.2. Samples of methods employed by the researcher to use mass data from documentary evidence

Exhibit 1. Colour coding of mass data from documentary evidence

Sample of methods employed by the researcher to use mass data from documentary evidence



Yellow: important actions/results of actions
Green: Cause of injuries
Blue: Request data

1.

http://www .co.uk

Tools:

Safety Model

Safety:

Diseases and Dangerous Occurrences

Passenger safety

The level of passenger safety is measured by the Passenger Safety . This measure is derived from a combination of two separate data sources, of which the first source is train accident risk data from the Model (PIM). Produced by the every quarter, the PIM provides a guide to the current train accident risk profile and the trends in this profile. It calculates this using precursor events data, such as broken rails or landslips, which are combined into six main groups (infrastructure failures, irregular working, public behaviour at level crossings, objects on the line, signals passed at danger, and trains and rolling stock). A subset of the is calculated, identifying passenger risks only, and it is that number that is used in calculating the PSI. Assessing train accident risk in this way avoids the effect of low frequency, high consequence events that could potentially distort the . Any actual accidents are highlighted in our Safety report.

The second element of the is calculated as the weighted number of personal injuries to passengers, at station level crossings and managed stations only, reported in ('Safety Management). This comprises those defined as reportable under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) as well as those which are not reportable, normalised per billion passenger kilometres. During 2012/13 there has been an 11 per cent decrease in passenger major injuries at managed stations compared with 2011/12. The major influence on this figure is the reduction in the number of passenger major injuries through slips, trips and falls on managed stations. Safety enhancements have been undertaken at a number of these stations in order to mitigate the risk of slips, trips and falls.

Workforce safety (fatalities and weighted injuries)

Slips, trips and falls remain consistently the most common cases of accidents to combined contractor workforce, accounting for 32.1 per cent of all workforce injury accidents, and 48.2 per cent of 3+ days lost time injuries and RIDDOR reportable accidents. The next most common causes of injuries are struck by object, manual handling and contact injuries.

We have identified ten key areas where we need to speed up our approach to ensuring the safety of our workforce and contractors. http://www .co.uk

Infrastructure wrong side failures

This measure comprises the number of higher risk (hazard index of 50 or above) infrastructure failures. Track, structures (including embankments) and power issues remain as the principal causes of such failures.

Level crossing misuse

This measure comprises the number of incidents where a motorised vehicle is struck by, or strikes, a train or any incident where a pedestrian or user of a non-motorised vehicle is struck and fatally injured by a train, or any near miss with a motorised vehicle or non-motorised vehicle or pedestrian.

Level crossing misuse, Collisions with road vehicles, Train striking pedestrian, Near miss with road vehicle, Near miss with non-vehicle users.

Exhibit 2. Categories of safety issues identified from documentary evidence

		Causes of accident	
		Main groups	**Sub groups**
Passenger/workforce*/ public safety	**1. Train accident**	1.1. Infrastructure wrong side failures (**Cause 1)	1.1.1. Track 1.1.2. Structures (including embankments) 1.1.3. Power issues
		1.2. Irregular working (**Cause 2)	1.2.1 Protection/isolation 1.2.2. Signaller error 1.2.3. Red zone working
		1.3. Public behaviour at level crossing (**Cause 3)	1.3.1. Level crossing misuse 1.3.2. Road vehicle occupants in collisions with trains 1.3.3. Road traffic accidents 1.3.4. Train occupants 1.3.5. Slips, trips and falls 1.3.6. Struck or trapped by crossing equipment 1.3.7. Passenger pedestrian struck by train on station crossing 1.3.8. Public pedestrian struck by train 1.3.9. Near miss with road vehicle 1.3.10. Near miss with non-vehicle users
		1.4. Objects on the line (**Cause 4)	
		1.5. Signals passed at danger (SPAD)(**Cause 5)	
		1.6. Trains and rolling stock (**Cause 6)	
	2. Personal injuries to passengers	2.1. At station level crossing	
		2.2. At Network Rail managed stations	2.2.1. Slips, trips and falls
	3. Fatalities and weighted personal injuries to workforce		3.1. Slips, trips and falls 3.2. Stuck by object 3.3. Manual handling 3.4. Contact injuries 3.5. Workforce electric shock 3.6. On-board injuries

		Causes of accident	
		Main groups	**Sub groups**
Harm at level crossing		1. Workforce errors	1.1. Signaller/crossing keeper error 1.2. Infrastructure worker error 1.3. Train / OTP driver error
		2. Instances of interference with crossing equipment (not train)	
		3. Level crossing misuse by misuse category	
		4. Trains striking gates or barriers at level crossings	4.1. Active - automatic protection 4.2. Active - manual protection 4.3. Passive

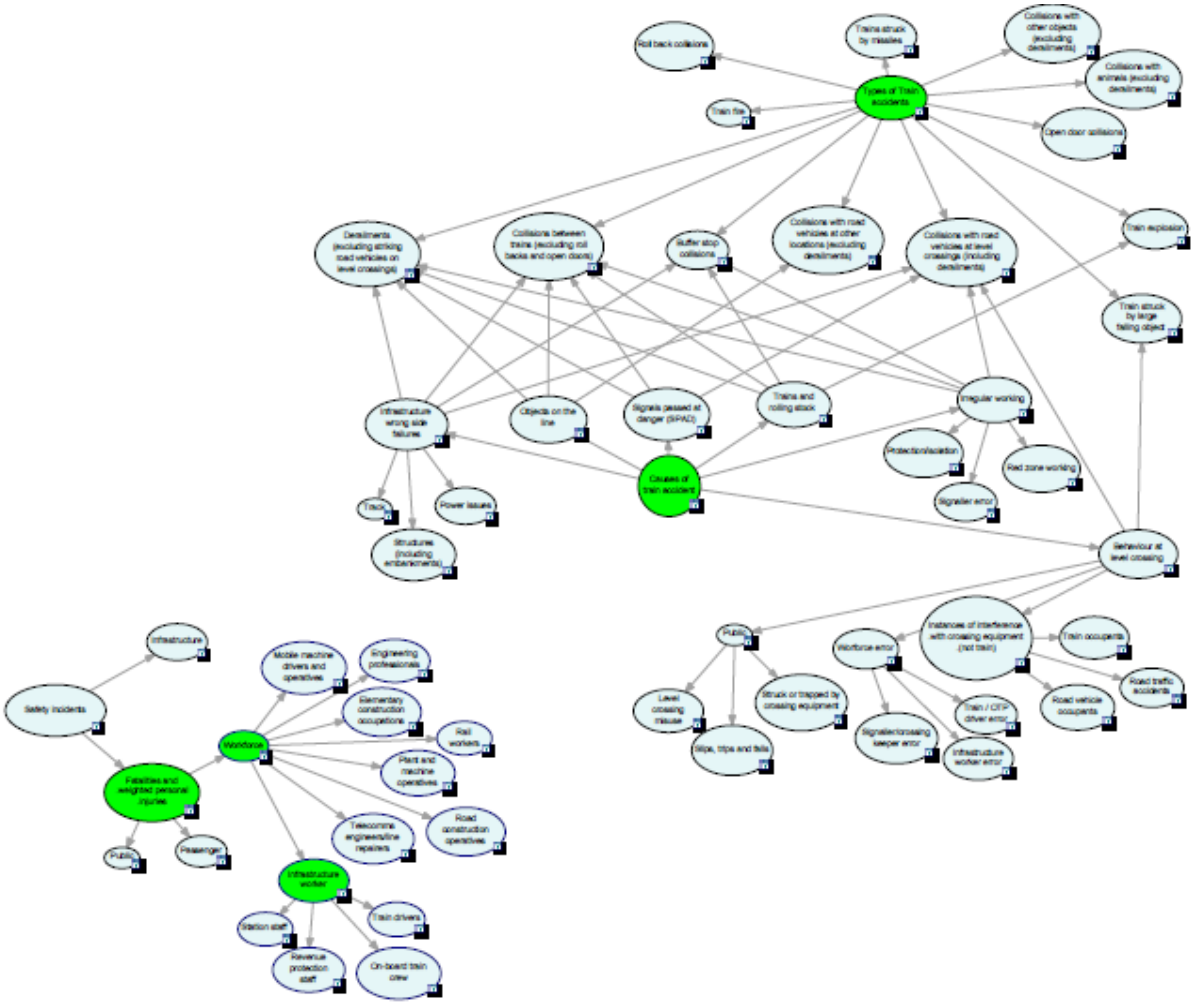
Comments

*(Workforce: road construction operatives, plant and machine operatives, elementary construction occupations, telecomms engineers/line repairers, mobile machine drivers and operatives, engineering professionals and rail workers/ infrastructure worker: train drivers, on-board train crew, revenue protection staff and station staff.)

**Types of Train accidents

Derailments (excluding striking road vehicles on level crossings) (Cause 1,2,4,5 and 6)
Collisions between trains (excluding roll backs and open doors) (Cause 1,2,5 and 6)
Roll back collisions
Buffer stop collisions (Cause 1,2, and 6)
Collisions with road vehicles at level crossings (including derailments) (Cause 1,2,3 and 5)
Collisions with road vehicles at other locations (excluding derailments) (Cause 4)
Open door collisions
Collisions with animals (excluding derailments)
Collisions with other objects (excluding derailments)
Trains struck by missiles
Train struck by large falling object (Cause 4)
Train fire
Train explosion (Cause 6)
Train division

Exhibit 3. The network model of key concepts of safety issues developed based on documentary evidence



A2.2.3. Sample of notes from telephone conversations between members of research team from CU and selected participants

A	B	D	F
Person	**Organisation**	**Date of call**	**Notes**
		19/09/2013	holds lots of data sets. Data comes from industry. does not generate new data. pass some of their data on to European regulators. All data sets are published on the website via a Data Portal. We need to register to get access to data in the Portal. The Portal contains Safety related data which includes: Reliability data and Enforcement data. It is important to ask for data about maintenance of assets, as they are key providers of data to . will attend the workshop and he suggests using Doodle Poll for scheduling the workshop
		19/09/2013	produces sensors to measure variation in certain parameters in the railway tracks Currently they have two main types of sensors driving all their projects for: Monitoring of track temperature Monitoring of track void (empty space underneath the track). This is still a project in progress and a significant number of trials are being run. In both cases, they send alarms related to certain levels of temperature/void captured by sensors. Alarms are sent to other parts of the industry for (safety) measures to be put in place, e.g. reducing the speed of trains in this area. will send us data tables related to both projects. will also attend the workshop.
		20/09/2013	collects an enormous amount of data about a wide range of issues including Performance, Reliability and Safety - data enables them to have an understanding of their railway in two main dimensions: Technical Performance and People Performance - does not have a data dictionary or taxonomy - There are numerous systems, each of them containing its own data sees data about Assets as particularly relevant as it has Safety implications - For example: There is a Maintenance Management System with data about Assets, failures and related causes and responses - Experts extract (manually) data from all systems and combine these For different purposes - For example, if There is an incident that disrupts or affects the railway, There is a process For understanding Safety and validate underlying assumptions by looking at data about LU domain, the Engineering domain and Experts' judgements. - data sets can informally be classified as relevant either For Performance or For Safety - has a Corporate Risk Model which models their railway and predicts any issues related to the Maintenance Management System. it is manually populated by the Experts upon analysis of the data that has got. - will attend the workshop at Coventry. We agreed that I would send John an email with further details about what our expectations are as to what types of data would be relevant For us.

A2.2.4. Samples of communication between members of research team from CU and selected participants through e-mail

A2.2.5. Design-shop invite letter, confirmation emails and design-shop agenda (The CKC research team decided to refer to the design-shop as workshop to omit any confusion)

Exhibit 1. CKC meeting invite letter – version 01 – first draft

Dear ___,

We are grateful to all stakeholders and contributors who have started providing input to the knowledge modelling exercise in the railway safety domain.

As part of the project a workshop will be held, the purpose of which is the elicitation of safety knowledge from experts. This will provide for a collaboratively data modelling activity designed to bring together various parts of the railway sector (industry and academia) to develop a cross-sector view of safety. A detailed agenda will follow.

The two-day workshop will be held at the Coventry University (address). Please see below for a Doodle poll for the choice of two sets of dates to let us know your availability (please choose both if you are available on both options).

Best regards,

Exhibit 2. CKC meeting invite letter – version 02 – final draft

Dear ___,

We are grateful to all stakeholders and contributors who have started providing input to the knowledge modelling exercise in the railway safety domain.

As part of the project a workshop will be held, the purpose of which is the elicitation of safety knowledge from experts. This will provide for a collaboratively data modelling activity designed to bring together various parts of the railway sector (industry and academia) to develop a cross-sector view of safety. A detailed agenda will follow.

We would like to invite you to attend this two-day workshop. It will be held at the Coventry University Technology Park, Please use this link -> for a Doodle poll for the choice of two sets of dates to let us know your availability (or that of a colleague from Thales who would be able to attend). Please choose both if both options are suitable.

The project funding allows for one-night accommodation and reasonable travel expenses to be reimbursed.

Please let us know whether you will be staying over so we can book accommodation.

Best regards,

Exhibit 3. Confirmation e-mail_01

Dear All,

Thank you for responding to the Doodle poll with your availability for the Railway Data and Safety workshop as part of the [redacted] project.

Based on the feedback received we can now confirm that the most suitable dates for the workshop are Thursday 23 to Friday 24 January 2014.

This workshop will be a collaborative exercise where participants will review and contribute to the improvement of the models produced by the project team, with a view to understanding the relationships between data and safety in the future railway.

The workshop is planned to start at 10.00 on Thursday 23rd January and finish by 15.00 on Friday 24th January 2014.

In preparation for the workshop we will be circulating in the New Year the work we will have completed in terms of data modelling, along with a detailed agenda for the two days.

Best regards,

Exhibit 4. Confirmation e-mail_02

Download Save to OneDrive - Coventry University

Dear Colleague,

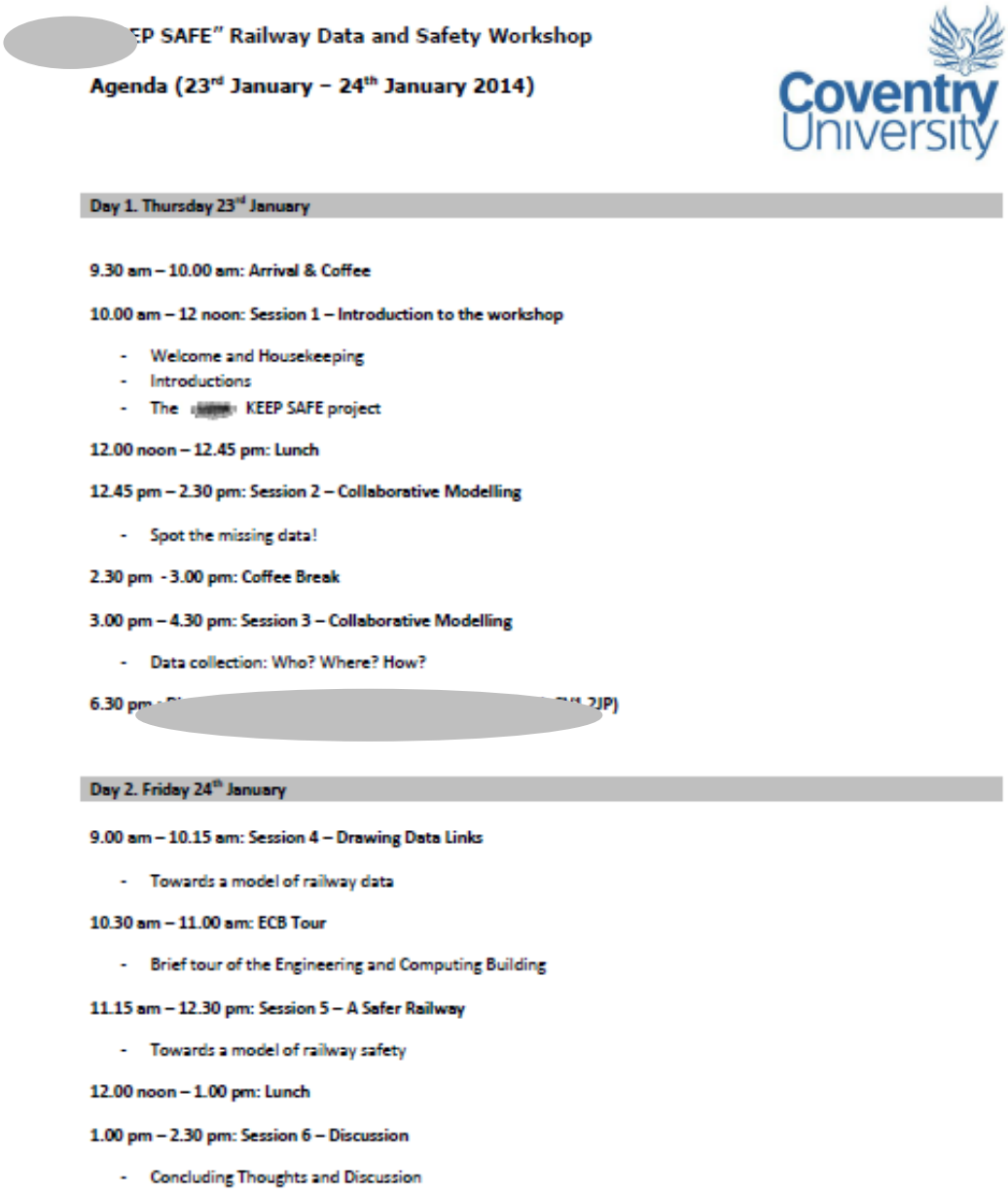
You are receiving this message because you have confirmed your attendance to the Railway Data and Safety workshop to be held this week at Coventry University as part of the [redacted]" project.

Please find attached an updated agenda for the two days. If you have confirmed that you need accommodation for Thursday, this has been booked for you.

We are looking forward to a successful event.

Best regards,

Exhibit 5. CKC meetings' agenda sent to the participants who accepted to participate



[redacted]EP SAFE" Railway Data and Safety Workshop

Agenda (23rd January – 24th January 2014)

Coventry University

Day 1. Thursday 23rd January

9.30 am – 10.00 am: Arrival & Coffee

10.00 am – 12 noon: Session 1 – Introduction to the workshop

- Welcome and Housekeeping
- Introductions
- The [redacted] KEEP SAFE project

12.00 noon – 12.45 pm: Lunch

12.45 pm – 2.30 pm: Session 2 – Collaborative Modelling

- Spot the missing data!

2.30 pm - 3.00 pm: Coffee Break

3.00 pm – 4.30 pm: Session 3 – Collaborative Modelling

- Data collection: Who? Where? How?

6.30 pm [redacted]

Day 2. Friday 24th January

9.00 am – 10.15 am: Session 4 – Drawing Data Links

- Towards a model of railway data

10.30 am – 11.00 am: ECB Tour

- Brief tour of the Engineering and Computing Building

11.15 am – 12.30 pm: Session 5 – A Safer Railway

- Towards a model of railway safety

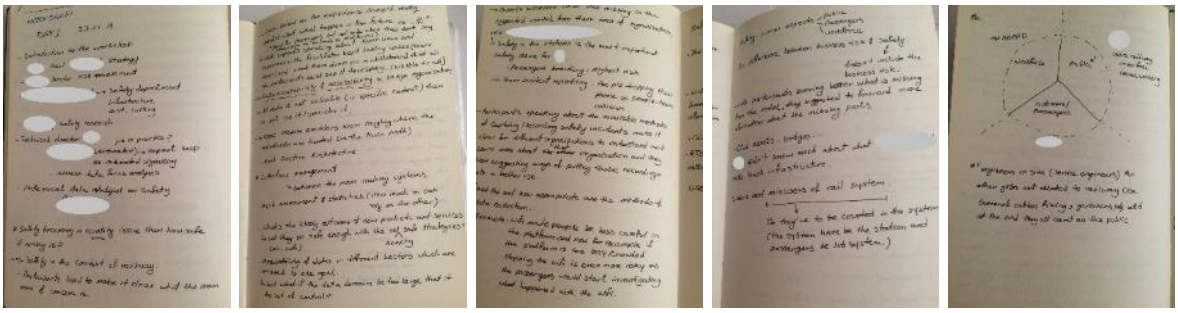
12.00 noon – 1.00 pm: Lunch

1.00 pm – 2.30 pm: Session 6 – Discussion

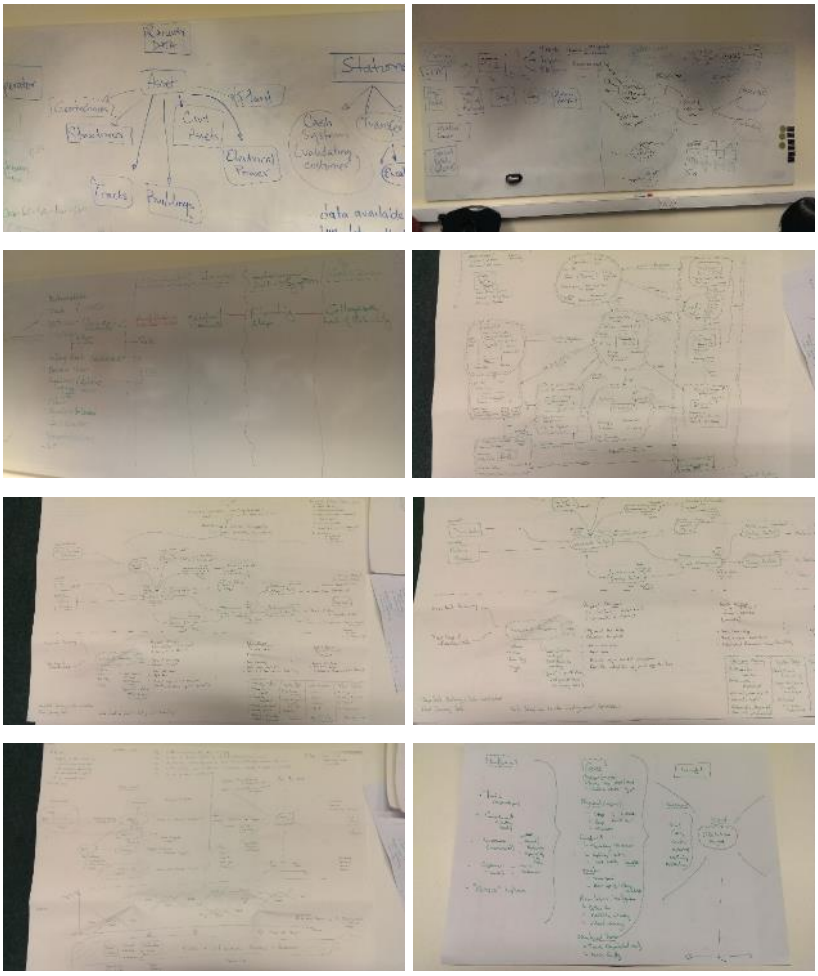
- Concluding Thoughts and Discussion

A2.3. Knowledge creation

A2.3.1. Samples of notes from the design-shop

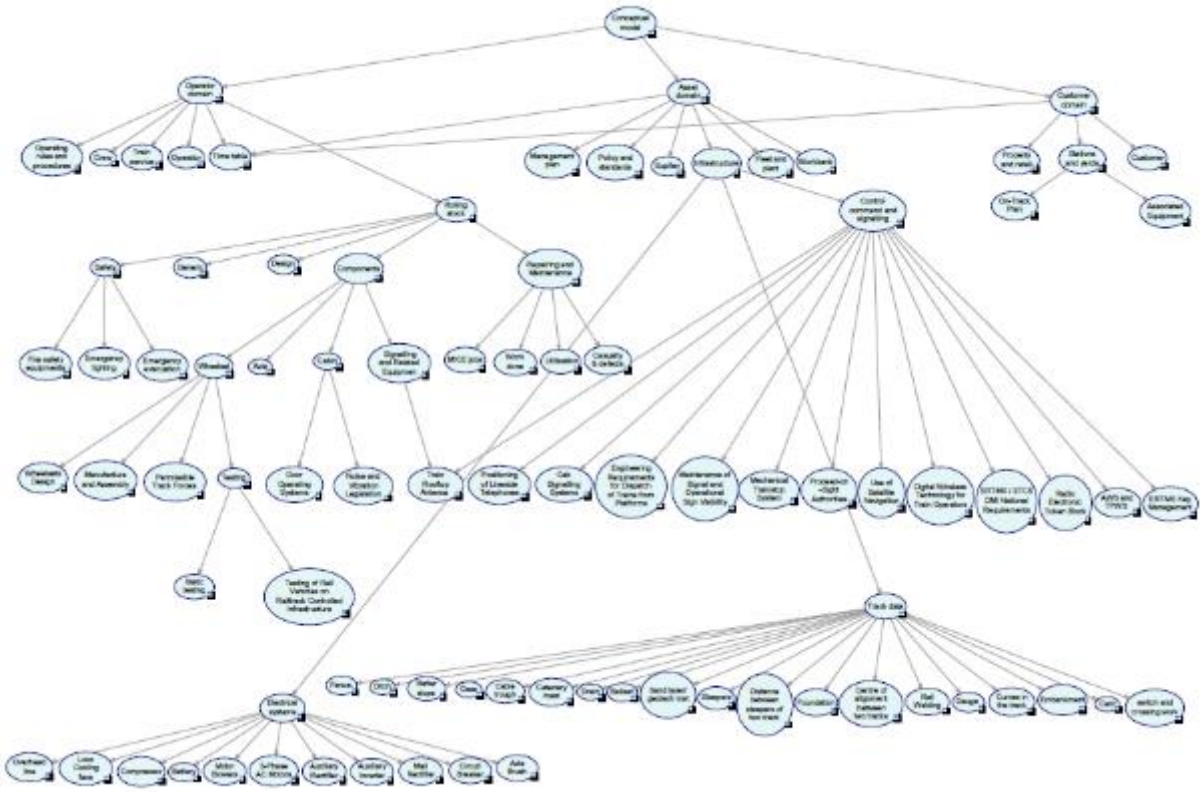


A2.3.2. Samples of collaborative mapping of the factors with negative impact on railway safety



A2.4. Review and reflect

A2.4.1. Samples of data model as outline by expert



Appendix B

Key ideas and themes from the implementation of Ep-s in the field

Key ideas and themes from the CKC project at BRS

I. Ep-s approach. The implementation of CKC based on collaborative problem-solving	
A. Outcomes of the application of Ep-s	The outcomes that were identified by individuals can be grouped into four key categories that are as follows: 1. Learning by experts All the experts mentioned that Ep-s helped them to review the information resources that are available at their organisation and learn about the data and information that they need is available at which organisations and how they can access and use these resources as a very reliable alternative to creating and developing them within their organisations. Examples of these ideas are as follows: *It helped us to recall the resources we have* *It showed that other organisations already have the data chunks that we have been investing on producing* *I did not know (one of the organisations) has been collecting such data that we can access. It really helps our organisation to prevent duplicating other organisation's work and instead develop a better work together* 2. Learning by stakeholders All the participants from diverse stakeholder groups agreed that Ep-s helped them to understand what safety means to each stakeholder group and it helped them to understand that all the organisations are very much concerned about improving the safety of rail transport and have been investing on addressing this issue. It helped them recognise the importance of combining experience of different stakeholder groups for investigating safety-related issued and developing a reliable solution. Examples of these ideas are as follows: *The discussions highlighted the need for involving experts from different organisations and now I can consider the outcome of these meeting as a benefit for my organisation* *We (one of the organisations) have been looking for that information for a long time* *This information will reduce the amount of time my team were spending on analysing safety data* 3. New explicit resources became available Several data models were developed, reviewed and revised by the participant which became a valuable resource for all the organisations involved in the CKC project. Example of senior manager comment about these data models is as follows: *It will help us to map the cause and effect quicker and also we can use these models to identify the units that needs improvement* 4. New communities of interest Participants agreed that the way Ep-s helped them to have a cleared picture of the problem and the factors influencing the

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	problem could not be achieved without such a meeting that involved many areas of problem-related experience. One of the comments is as follows: *I would need to send and receive many e-mails to solve the issue that is addressed this quickly by the help of many expert' gathered today* *I found the 'credible problem resolution' part of the process very important and helpful*
B. Mapping the root causes of the complex problem	They participants agreed that the developed data models during CKC meetings (the design-shop) helped them to understand the influence of their work on the work of other organisations and safety of rail industry in general. They found this collaborative knowledge creation a successful approach that involves all the stakeholder groups who are influence by or have influence on the performance of other organisations to solve the problem together. Some of their comments are as follows: *This process improved my understanding about the relationship between individual organisations' performance and the performance of the rail industry* *The data models clarified how the railway safety is altered or affected by work of different organisations*
C. Participants	Once the required knowledge resources were identified, the potential stakeholder groups were identified. Two senior managers from BRS selected potential participants from different originations within the identified stakeholder groups based on three principles that are as follows: 1. Senior managers with significant problem-centred knowledge and experience in dealing with safety-related issues 2. Senior managers from organisations that hold safety-related data and information 3. Senior manager from originations which their performance had been influenced by safety-related issues
D. Type of knowledge	Knowledge related to root causes of safety failure was successfully presented and contributed to problem-solving
E. Communication technologies	It became evident that information system can only assist knowledge transfer and it does not improve the process of engaging diverse stakeholder groups in solving complex problems. Evidence presented in this thesis shows that communication technologies were only used for the purposes of transferring safety-related data and organising the CKC meetings which were conducted in the form of two-day design-shop.
II. Other approaches. The limitations of existing approaches to CKC in comparison with the application of Ep-s	
A. Demands from participants	Given that the involvement of experts was critical to the success of Ep-s and the geography distributed organisations, attending the two-day design-shop for series of CKC meetings in Coventry reimbursed travel expenses, provided accommodation and hospitality (funded as part of the project costs). Although it was not possible to compensate for their time, this project contributed to the performance of the organisations involved.
B. Collaborative environment	Notes taken by the researcher during and after the CKC meetings show that:

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	1. The CKC meetings took place in a relaxed, informal environment that helped experts to contribute their knowledge however they found it easier to do, e.g. through the use of examples, comparing the limitations of their individual organisation's approaches to understanding and addressing safety-related issues 2. There is no evidence that suggests that any of the experts found it difficult to contribute their perception on the topics discussed.
C. Motivation	Data collected show that experts from different stakeholder groups were motivated to actively participate in the CKC project for different reasons that are as follows: 1. The purpose of the collaboration. Findings the root causes of safely-related issues affecting the performance of the rail industry had been a complex problem and addressing them had been the concern of all the stakeholder groups 2. The performance of some of the stakeholder groups were challenged by the performance of organisations that are pure monopoly and participating in the CKC could create an environment to discuss this issue with such organisations 3. It could raise awareness about the area of work of different stakeholder groups and how each of them could benefit from collaborative knowledge creation
III. Group dynamics. Ep-s and leading group dynamics	
A. Trust	Evidence shows that clarifying the purpose of the CKC meetings leaded the participants to openly contribute their knowledge and experience
B. Communication	The observation and notes taken during the CKC meetings show that participation was not restricted to experts' contributions in any of the CKC meetings during the two-day design-shop. Stakeholders contributed actively to the discussions, even when it was only to raise questions and concerns in the search for experts' answers and support
C. The role of leader(s)	The data collected highlight that leading the CKC meetings by the researcher and KET research expert had positive impact on addressing knowledge boundaries and directing participants to focus on knowledge creation. It also shows the importance of including senior manager from BRS as CKC leader who had significant positive influence on leading the participants in terms of contributing to problem-solving when participants were distracted by sharing some of their knowledge and experience which were irrelevant to addressing the problem.
IV. Evaluation. Evaluation of Ep-s as an approach to CKC	
The CKC project was evaluated based on getting feedback from the participants immediately after the CKC meetings which were mostly during the breaks of the design-shop by asking participants about the impact of the meetings on their understanding of the problem and about the value of the knowledge created through Ep-s for their organisation. The comments were generally positive, in particular about the collaboratively developed data models. Senior managers from BRS, in particular, found this project a successful collaboration.	

Appendix C

Publications

García-Pérez, A., Shaikh, S. A., Kalutarage, H., & Jahantab, M. (2015). Towards a knowledge-based approach for effective decision making in railway safety. *Journal of Knowledge Management, 19*(3), 641-659.

Jahantab, M., Garcia-Perez, A., & Shaikh, S. (2014). Knowledge elicitation through collaborative modelling: A case study of the British railway industry. *Proceedings of the 14th European Conference on Knowledge Management. 2*, pp. 471-479. Santarem: Academic Conferences and Publishing International Limited.

Jahantab, M., & García-Pérez, A. (2013). Knowledge Management, Call Centres and Customer Satisfaction: A Case Study From the Transport Sector. *Proceedings of the 14th European Conference on Knowledge Management. 1*, pp. 295-299. Kaunas: Academic Conferences and Publishing International Limited.